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NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

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02 Aircraft 864
Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc.; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

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31 Space Vehicles 963
Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

32 Structural Mechanics 966
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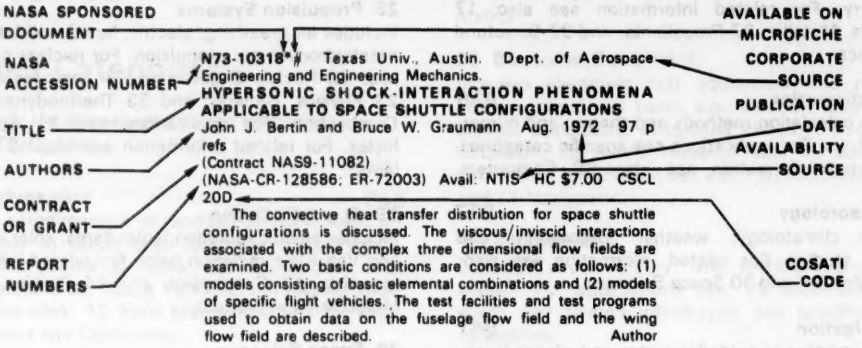
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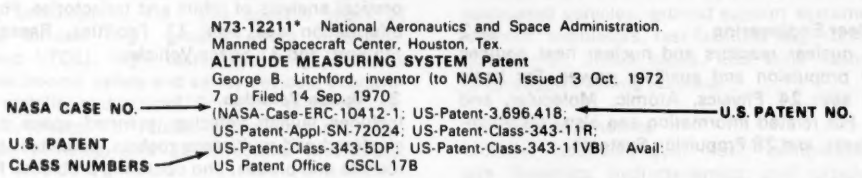
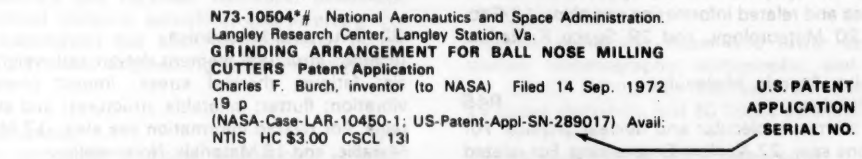
The convective heat transfer distribution for space shuttle configurations is discussed. The viscous/inviscid interactions associated with the complex three dimensional flow fields are examined. Two basic conditions are considered as follows: (1) models consisting of basic elemental combinations and (2) models of specific flight vehicles. The test facilities and test programs used to obtain data on the fuselage flow field and the wing flow field are described. Author

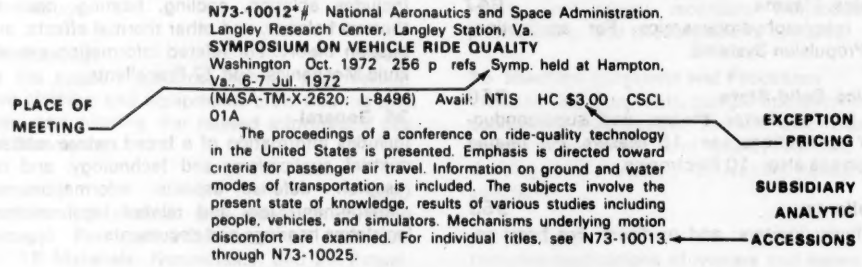
PATENT CITATION


NASA CASE NO.
U.S. PATENT CLASS NUMBERS
U.S. PATENT NO.
N73-12211* National Aeronautics and Space Administration. Manned Spacecraft Center, Houston, Tex.
ALTITUDE MEASURING SYSTEM Patent
George B. Litchford, inventor (to NASA) Issued 3 Oct. 1972 7 p Filed 14 Sep. 1970
(NASA-Case-ERC-10412-1; US-Patent-3,696,418; US-Patent-Appl-SN-72024; US-Patent-Class-343-11R; US-Patent-Class-343-5DP; US-Patent-Class-343-11VB) Avail: US Patent Office CSCL 17B

PATENT APPLICATION CITATION


U.S. PATENT APPLICATION SERIAL NO.
N73-10504*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
GRINDING ARRANGEMENT FOR BALL NOSE MILLING CUTTERS Patent Application
Charles F. Burch, inventor (to NASA) Filed 14 Sep. 1972 19 p
(NASA-Case-LAR-10450-1; US-Patent-Appl-SN-289017) Avail: NTIS HC $3.00 CSCL 13I

PRIMARY ANALYTIC CITATION AND ABSTRACT


PLACE OF MEETING
EXCEPTION PRICING
SUBSIDIARY ANALYTIC ACCESSIONS
N73-10012*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
SYMPOSIUM ON VEHICLE RIDE QUALITY
Washington Oct. 1972 256 p refs Symp. held at Hampton, Va., 6-7 Jul. 1972
(NASA-TM-X-2620; L-8496) Avail: NTIS HC $3.00 CSCL 01A
The proceedings of a conference on ride-quality technology in the United States is presented. Emphasis is directed toward criteria for passenger air travel. Information on ground and water modes of transportation is included. The subjects involve the present state of knowledge, results of various studies including people, vehicles, and simulators. Mechanisms underlying motion discomfort are examined. For individual titles, see N73-10013 through N73-10025.

SUBSIDIARY ANALYTIC CITATION

PRIMARY ANALYTIC ACCESSION AND LOCATION OF FULL CITATION AND ABSTRACT
PAGES IN PRIMARY REPORT
N73-10014* Douglas Aircraft Co., Inc., Long Beach, Calif.
AN AIRCRAFT MANUFACTURER'S APPROACH TO RIDEABILITY CRITERIA
R. C. OMassey, H. Leve, and J. G. Gaume In NASA. Langley Res. Center Symp. on Vehicle Ride Quality Oct. 1972 p 23-49 refs (For availability see N73-10012 01-02)
CSCL 01A

VOLUME 11 NUMBER 8 / APRIL 23, 1973

Scientific and Technical Aerospace Reports

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01 AERODYNAMICS

Includes aerodynamics of bodies, combinations, internal flow in ducts and turbomachinery; wings, rotors, and control surfaces. For applications see: 02 Aircraft and 31 Space Vehicles. For related information see also: 12 Fluid Mechanics; and 33 Thermodynamics and Combustion.

N73-16981# Aeronautical Research Labs., Melbourne (Australia).
A SIDE MOUNTED SUPERSONIC INTAKE AND THE PROBLEM OF THREE DIMENSIONAL BOUNDARY LAYER SEPARATION
Murdoch Culley Jun. 1972 49 p refs
(ARL/ME-137; ISBN-642-97744-5) Avail: NTIS HC $4.50

As part of a program to study integrated supersonic intakes and their associated interference problems, a model has been constructed consisting of a half-conical intake mounted on the side of a fuselage. The flow field around this model has been qualitatively examined using schlieren and surface flow techniques. A strong three dimensional separation of the fuselage boundary layer has been observed; the location of the separation line is sensitive to the condition of the fuselage boundary layer and to the intake static pressure field. As a result of three dimensional flow over the shock cone, the intake has a weaker pressure field than an equivalent axisymmetric intake. Consequently the observed separation occurs under the combined influence of the normal and cone shocks, and thus the location of the separation line is sensitive to the position of the normal shock. The separation gives rise to an unsteady shock wave, and this indicates, despite the finely detailed flow patterns obtained, that the separation is unsteady. This boundary layer shock generates a Mach number gradient and thus modifies the intake shock system. Author

N73-16982*# Northrop Corporate Labs., Hawthorne, Calif.
ANALYSIS OF HIGH-ASPECT-RATIO JET-FLAP WINGS OF ARBITRARY GEOMETRY
Peter B. S. Lissaman Washington NASA Feb. 1973 58 p refs
(Contract NAS1-10627)
(NASA-CR-2179) Avail: NTIS HC $3.00 CSCL 01A

An analytical technique to compute the performance of an arbitrary jet-flapped wing is developed. The solution technique is based on the method of Maskell and Spence in which the well-known lifting-line approach is coupled with an auxiliary equation providing the extra function needed in jet-flap theory. The present method is generalized to handle straight, uncambered wings of arbitrary planform, twist, and blowing (including unsymmetrical cases). An analytical procedure is developed for continuous variations in the above geometric data with special functions to exactly treat discontinuities in any of the geometric and blowing data. A rational theory for the effect of finite wing thickness is introduced as well as simplified concepts of effective aspect ratio for rapid estimation of performance. Author

N73-16983*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
GENERALIZE AERODYNAMIC COEFFICIENT TABLE STORAGE, CHECKOUT AND INTERPOLATION FOR AIRCRAFT SIMULATION
Frank Neuman and Neil Warner Jan. 1973 107 p
(NASA-TM-X-62229) Avail: NTIS HC $7.50 CSCL 01A

The set of programs described has been used for rapidly introducing, checking out and very efficiently using aerodynamic tables in complex aircraft simulations on the IBM 360. The preprocessor program reads in tables with different names and dimensions and stores them on disc storage according to the specified dimensions. The tables are read in from IBM cards in a format which is convenient to reduce the data from the original graphs. During table processing, new auxiliary tables are generated which are required for table cataloging and for efficient interpolation. In addition, DIMENSION statements for the tables as well as READ statements are punched so that they may be used in other programs for readout of the data from disc without chance of programming errors. A quick data checking graphical output for all tables is provided in a separate program. Author

N73-16984# Aeronautical Research Inst. of Sweden, Stockholm.
BOUNDARY LAYER STUDIES ON A TWO DIMENSIONAL HIGH LIFT WING
Bjoern L. G. Ljungstroem 1972 110 p refs
(FAA-AU-862) Avail: NTIS HC $7.50

Wind tunnel tests were carried out with a 2-dimensional wing model equipped with a leading edge slat and a trailing edge flap. The objectives of the investigation have been the following: (1) to increase general understanding of the viscid and inviscid flow phenomena on a high lift wing and significance to the high lift performance. And (2) to investigate the significance of Reynolds number effects for high lift wings by an attempt to simulate higher Reynolds number boundary layers. The model was equipped with two suction slots at a distance of 30 slot widths from the trailing edges of the leading edge slat and the main wing. The different amounts of suction applied resulted in a reduced boundary layer thickness at the trailing edge of the leading edge slat and the main wing, respectively. The various suction configurations have been tested for two leading edge slat gaps. The pressure distributions and the complete boundary layer velocity profiles have been mapped at a few angles of attack. Author

N73-16985# Aeronautical Research Inst. of Sweden, Stockholm.
A COMPUTER PROGRAM FOR THE PREDICTION OF AERODYNAMIC CHARACTERISTICS OF WING-BODY-TAIL COMBINATIONS AT SUBSONIC AND SUPERSONIC SPEEDS, PART 2
S. Anders and L. Gustavsson 1972 120 p refs
(FFA-AU-635-Pt-2) Avail: NTIS HC $8.00

A computer program for calculating the aerodynamic characteristics of wing-body combinations at subsonic and supersonic speeds is described. The aerodynamic theory is outlined and several calculated examples with comparisons to experimental results are shown. A description of the computer program is provided together with a user's manual. The results indicate that the method is a valuable tool for analysis and design purposes. Author

N73-16986*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYTICAL STUDY ON A TWO-DIMENSIONAL PLANE OF THE OFF-DESIGN FLOW PROPERTIES OF TANDEM-BLADED COMPRESSOR STATORS
Nelson L. Sanger Washington Mar. 1973 43 p refs
(NASA-TM-X-2734; E-7031) Avail: NTIS HC $3.00 CSCL 20D

The flow characteristics of several tandem bladed compressor stators were analytically evaluated over a range of inlet incidence angles. The ratios of rear-segment to front-segment chord and camber were varied. Results were also compared to the analytical performance of a reference solid blade section. All tandem blade sections exhibited lower calculated losses than the solid stator. But no one geometric configuration exhibited clearly superior characteristics. The front segment accepts the major effect of overall incidence angle change. Rear- to front-segment camber ratios of 4 and greater appeared to be limited by boundary-layer separation from the pressure surface of the rear segment. Author

02 AIRCRAFT

Includes fixed-wing airplanes, helicopters, gliders, balloons, ornithopters, etc; and specific types of complete aircraft (e.g., ground effect machines, STOL, and VTOL); flight tests; operating problems (e.g., sonic boom); safety and safety devices; economics; and stability and control. For basic research see: 01 Aerodynamics. For related information see also: 31 Space Vehicles; and 32 Structural Mechanics.

N73-16987 California Univ., Los Angeles.
AERODYNAMIC AND STRUCTURAL DESIGN CONSIDERATIONS FOR HIGH LIFT BIPLANE WING SYSTEMS Ph.D. Thesis
Robert Briand Addoms 1971 172 p
Avail: Univ. Microfilms Order No. 72-13586

Modern theoretical methods and computer technology are applied to the design of biplane wing systems. Biplane aerodynamics are discussed, with emphasis on the stall matching and induced camber effects which make the biplane different from the monoplane. The theoretical basis of a method for designing biplane airfoils is presented. The method uses three-dimensional potential flow theory, combined with two-dimensional thin airfoil theory. The application of this method to an actual design is described in detail. It is shown that for virtually any biplane configuration of practical interest, it is possible to design a biplane wing system which sacrifices nothing in maximum usable lift coefficient without flaps to monoplanes, and next to nothing with flaps. Such a wing system has approximately half the weight per unit area of a well-designed monoplane wing.
Dissert. Abstr.

N73-16988*# California Univ., Davis. Dept. of Mechanical Engineering.
EQUATIONS OF MOTION FOR THE X-14 AIRCRAFT, PHASE 2 STUDY Quarterly Status Report, 1 Jul. - 31 Dec. 1972
Myron A. Hoffman, Walter. V. Loscutoff, and J. A. Zaevers Dec. 1972 73 p refs
(Grant NGR-05-004-051)
(NASA-CR-130760; QSR-7) Avail: NTIS HC $5.75 CSCL 01C

A study of the control and power requirements of the X-14 VTOL aircraft is presented. The complete equations of motion for X-14 are derived. The fundamental assumption is that the aircraft is a single rigid body. The equations of motion are derived with respect to a set of axes fixed to the aircraft. Additional assumptions used are that any wind disturbances are irrotational that the twin engines used on the aircraft rotate in the same direction at the same speed and that the engine exhaust is diverted by means of vanes to provide a direction varying thrust vector. The equations obtained are subsequently linearized about various reference conditions and numerical values for the trim parameters and the stability derivatives at these conditions are tabulated. Author

N73-16989# Advisory Group for Aerospace Research and Development, Paris (France).
STABILITY AND CONTROL
Nov. 1972 305 p refs Proceedings of the 40th Meeting of the Flight Mech. Panel of AGARD, Braunschweig West Germany, 10-13 Apr. 1972
(AGARD-CP-119) Avail: NTIS HC $17.25

Summaries of papers presented at conferences concerning aircraft stability, control, maneuverability and design are reported. For individual titles, see N73-16990 through N73-17013.
Author

N73-16990 National Aerospace Lab., Amsterdam (Netherlands).
SUMMARY OF AGARD MEETING ON PROBLEMS OF THE COCKPIT ENVIRONMENT, NOVEMBER 1968 IN AMSTERDAM, NETHERLANDS
J. J. P. Moelker *In* AGARD Stability and Control Nov. 1972 9 p refs (For availability see N73-16989 08-02)

Problems related to the process of man-machine communication are discussed with emphasis on cockpit information-generation, display, and transfer. Techniques for the evaluation of cockpit geometry, display systems and cockpit workload are summarized together with the associated anthropometrical data and types of display systems. Author

N73-16991 Centre d'Essais en Vol, Bretigny-sur-Orge (France).
AEROELASTIC EFFECTS FROM A FLIGHT MECHANICS STAND POINT
J. F. Renaudie *In* AGARD Stability and Control Nov. 1972 17 p In FRENCH (For availability see N73-16989 08-02)

Methods for calculating the effects of aeroelasticity on aircraft flight are discussed. Data cover aerodynamics of flexible rotors, flight dynamics of flexible aircraft, experimental determination of flexibility for flexible aircraft, stability augmentation systems, and problems of determining influence of aerodynamic forces on flexible aircraft. Transl. by E.H.W.

N73-16992 British Aircraft Corp., Preston (England). Military Aircraft Div.
SUMMARY PAPER ON SIMULATION MEETING, SPRING 1970 AT NASA RESEARCH CENTER
A. G. Barnes *In* AGARD Stability and Control Nov. 1972 5 p ref (For availability see N73-16989 08-02)

The conference on flight simulation is summarized. Topics discussed include: simulation objectives, simulator characteristics, design of experiments, simulation results, and analysis. F.O.S.

N73-16993 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
HANDLING QUALITIES CRITERIA AND REQUIREMENTS
William E. Lamar and Terry L. Neighbor *In* AGARD Stability and Control Nov. 1972 19 p refs (For availability see N73-16989 08-02)

Summaries of papers presented at the conference on flight qualities are presented. Topics discussed include: flying qualities for conventional and V/STOL aircraft, man-machine research, and the establishment of criteria. F.O.S.

N73-16994* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
CONSIDERATIONS FOR STABILITY AND CONTROL OF V/STOL AIRCRAFT: A REVIEW OF AGARD REPORT 577
Seth B. Anderson and Laurel G. Schroers (Army Mobility R and D Lab.) *In* AGARD Stability and Control Nov. 1972 10 p refs (For availability see N73-16989 08-02)
CSCL 01B

Revisions which have been made to previous V/STOL handling qualities requirments based on criteria are discussed. A discussion of the pilot's desire for a particular characteristic is given. In addition, data and reference material are provided to back up the proposed criteria to permit the user to understand the limitations of the data on which the criteria are based. A review is included of several controversial areas including pitch control sensitivity, static longitudinal stability, roll control power, roll-yaw cross coupling, and vertical flight path control. Author

N73-16995 Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

MISSION EFFECTS ON STABILITY AND MANEUVERABILITY
Charles B. Westbrook *In* AGARD Stability and Control Nov. 1972 13 p refs (For availability see N73-16989 08-02)

The relationship between the mission requirements of a piloted aircraft and its stability and maneuverability are defined. The framework utilized in current U.S. Air Force handling qualities requirements, i.e., classification of aircraft, flight phases, levels, states, etc., is described. Examples of various aircraft designed for one mission and then utilized for other missions are given. A discussion is presented of the problems encountered when the detailed mission requirements are not clear, such as with V/STOL aircraft, reentry vehicles, etc. Problems encountered with off-design conditions and operation at the limits of the flight envelope are discussed with examples. The various methods open to the designer for achieving the proper compromises in design of an aircraft are outlined. Author

N73-16996 British Aircraft Corp., Preston (England). Military Aircraft Div.
DESIGN CONSIDERATIONS FOR THE SATISFACTORY STABILITY AND CONTROL OF MILITARY COMBAT AEROPLANES
B. R. A. Burns *In* AGARD Stability and Control Nov. 1972 28 p refs (For availability see N73-16989 08-02)

Design criteria for achieving satisfactory stability and control for military aircraft are reviewed along with official requirements. Some of the difficulties of designing to meet the standards of these criteria are considered. Topics discussed include longitudinal stability and control, and lateral stability and control. Author

N73-16997 Technische Hochschule, Darmstadt (West Germany).
THE EFFECTS OF THRUST CHARACTERISTICS ON LONGITUDINAL STABILITY IN SUPERSONIC FLIGHT
G. Sachs *In* AGARD Stability and Control Nov. 1972 15 p refs (For availability see N73-16989 08-02)

The influence of the variation of thrust with speed and height on the dynamic stability of the longitudinal motion in supersonic flight is shown. The effects directly related to thrust changes are described along with the effects due to pitching moments which, associated with thrust characteristics, depend on speed and height. The thrust influence on two methods of artificial stabilization of long-term modes is also investigated. Author

N73-16998 Societe Nationale Industrielle Aerospatiale, Paris (France). Departement Recherche.
INFLUENCE OF THE MASS AND MASS DISTRIBUTION ON FLYING QUALITIES [INFLUENCE DE LA MASSE ET DE LA REPARTITION DE LA MASSE SUR LES QUALITES DE VOL]
Marc Mesniere *In* AGARD Stability and Control Nov. 1972 9 p refs In FRENCH (For availability see N73-16989 08-02)

Several techniques pertinent to determining the influence of mass and mass distribution on the handling qualities of aircraft are presented. Particular attention was given to lateral and longitudinal maneuverability and the influence of inertia on the principle axis tilt angle. Several examples using a Corvett aircraft are given. Transl. by E.H.W.

N73-16999 Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
THE ROLE OF THEORY AND CALCULATIONS IN THE REFINEMENT OF FLYING QUALITIES
W. J. G. Pinsker *In* AGARD Stability and Control Nov. 1972 13 p refs (For availability see N73-16989 08-02)

The present state of the art in handling qualities research and design is broadly surveyed with particular emphasis on the role of theory and paper studies in this field. The signficance and scope of handling criteria is critically discussed as setting targets for flying qualities design. The capabilities and limitations of theory are then considered in such areas as derivative prediction, rigid-body stability and response calculations, predictions of stability under partial constraint and under active pilot control. Finally some general consideration is given to novel flying qualities problems associated with the introduction of stability and control augmentation systems. Author

N73-17000 Royal Netherlands Aircraft Factories Fokker, Schiphol-Oost. Aerodynamics Dept.
ADJUSTMENT OF FLYING QUALITIES BY WIND TUNNEL TESTING
Tj. Schuringa *In* AGARD Stability and Control Nov. 1972 7 p (For availability see N73-16989 08-02)

Two examples of the wind tunnel approach to the flying qualities of the Fokker F28 Fellowship aircraft are described, one dealing with the development of the elevator surface, and the other with the development of stall characteristics. Author

N73-17001 Naval Air Systems Command, Washington, D.C. Advanced Technology Section.
FLIGHT SIMULATION: A SIGNIFICANT AID IN AIRCRAFT DESIGN
Ralph C. AHarrah *In* AGARD Stability and Control Nov. 1972 17 p refs (For availability see N73-16989 08-02)

The role of flight simulation in the development of the S-3 and F-14 aircraft is described along with the facilities used. An appraisal is included of simulation technology as applied to aircraft design. Author

N73-17002 Royal Aircraft Establishment, Bedford (England). Aerodynamics Dept.
THE ROLE OF FREE-FLIGHT MODELS IN AIRCRAFT RESEARCH AND DEVELOPMENT
R. Fail *In* AGARD Stability and Control Nov. 1972 14 p refs (For availability see N73-16989 08-02)

The special features of free-flight models are discussed. Two examples are given of tests in the field of flight mechanics. Preparations are described for a program of tests which is about to start at RAE to investigate the low-speed stall and post-stall dynamics of aircraft. Attention is concentrated on the planning of the tests and the instrumentation and control system in the model. Some details are given of the model handling and retrieval systems. Author

N73-17003 British Aircraft Corp., Preston (England). Commercial Aircraft Div.
THE EFFECT OF ENGINE FAILURE AT SUPERSONIC SPEEDS ON A SLENDER AIRCRAFT: PREDICTED AND ACTUAL
C. S. Leyman and R. L. Scotland *In* AGARD Stability and Control Nov. 1972 8 p (For availability see N73-16989 08-02)

The effect of engine failure on the aerodynamic characteristics of a supersonic aircraft were studied. Topics discussed include: prediction of aircraft stability derivatives, prediction of forces and moments due to engine failure, preflight simulation experience, and flight test results. F.O.S.

N73-17004 Aerospatiale Usines de Toulouse (France).
CALCULATION OF INDUCED LOAD BY VARIATION IN COURSE DURING ANY MANEUVER [CALCUL DES CHARGES INDUITES PAR LA CLEXIBILITE AU COURS D'UNE MANOEUVRE QUELCONQUE]
A. Marsan *In* AGARD Stability and Control Nov. 1972 9 p In FRENCH (For availability see N73-16989 08-02)

A general formula for calculating load influence on aircraft flexibility is presented along with illustrations. A comparison was made of the load effects in rigid and transverse flexible aircraft. Three maneuvers, - lifting moments and forces, checked pitching, and checked rolling - were used for the analysis. Transl. by E.H.W.

N73-17005* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
ACTIVE CONTROL OF AEROELASTIC RESPONSE
A. Gerald Rainey, Charles L. Ruhlin, and Maynard C. Sandford *In* AGARD Stability and Control Nov. 1972 8 p refs (For availability see N73-16989 08-02)

Conceptual and wind-tunnel programs leading to the development of technology for applying active controls to the suppression of flutter were studied to provide a powerful tool for required safety margins for flutter in future high-performance supersonic aircraft. The nature of flutter considerations in the design of the U.S. SST prototype aircraft is described as an

example of the type of application where active flutter suppression shows promise. Author

N73-17006 Aeronautical Systems Div., Wright-Patterson AFB, Ohio. B-1 Airframe Div.
PREDICTION OF AEROELASTIC HINGE MOMENT EFFECTS ON STABILITY AND CONTROLLABILITY
John W. Carlson *In* AGARD Stability and Control Nov. 1972 5 p (For availability see N73-16989 08-02)

The effect of aeroelastic deflections on the stability and control characteristics are studied. Some examples of difficulties are shown that have resulted in control problems and aircraft limitations. Methods of predicting hinge moments are reviewed and some of the problems that arise by the use of these methods are discussed. A program for the analysis of structural deformations is described which may be used to analyze many aeroelastic problems. Author

N73-17007 Aeritalia, Turin (Italy).
CONSIDERATIONS ON THE MANUAL FLIGHT CONTROL DESIGN OF A MILITARY TRANSPORT AIRCRAFT
Antonio Filisetti and Giuseppe Ferretti *In* AGARD Stability and Control Nov. 1972 20 p refs (For availability see N73-16989 08-02)

Criteria for designing manual control systems for military transport aircraft are presented including a guide to the choice of the manual control parameter. Practical problems concerning the nonlinear hinge moments behavior and the control force scatter with the flight conditions are discussed. Aspects of matching manual operated ailerons with hydraulically driven spoilers are emphasized along with practical methods for designing spring-tab control surfaces. Author

N73-17008 Messerschmitt-Boelkow-Blohm G.m.b.H., Ottobrunn (West Germany).
POWERED CONTROLS, INFLUENCE ON STABILITY AND MANEUVERABILITY
Gerhard K. Kissel *In* AGARD Stability and Control Nov. 1972 13 p (For availability see N73-16989 08-02)

The influence is discussed of powered controls on the dynamic and static behavior of modern high performance aircraft. The possibilities of improving the stability and maneuverability by interconnections in the various axes are considered, and an example for a modern fighter type aircraft is demonstrated. Author

N73-17009 Boeing Co., Seattle, Wash.
FLY-BY-WIRE AND ARTIFICIAL STABILIZATION DESIGN
R. L. Schoenman *In* AGARD Stability and Control Nov. 1972 13 p (For availability see N73-16989 08-02)

The implementation of artificial stabilization to correct serious stability and control deficiencies is discussed for meeting the performance demands for aircraft which operate over a broad flight envelope such as VTOL, STOL, and SST. For this class of aircraft safety-of-flight is dependent on the integrity of these systems, and has resulted in the development of redundant system designs. The conventional SAS design approach is compared to that recommended for those vehicles which require augmentation for safety-of-flight. The impact of system redundancy on maintainability and operating costs is also discussed. A system is proposed which features integration of critical flight functions, and the use of digital computation to simplify system complexity. Author

N73-17010 Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.
PILOT WORKLOAD: A CONCEPTUAL MODEL **c05**
R. G. Thorne *In* AGARD Stability and Control Nov. 1972 6 p (For availability see N73-16989 08-02)

A conceptual model is presented for the study of the situations when, some of the crew, some of the time are unable to complete satisfactorily some of their tasks. A more realistic simulation of the difficult tasks is recommended. Author

N73-17011 Royal Aircraft Establishment, Farnborough (England). Aerodynamics Dept.
THE ROLE OF THEORETICAL STUDIES OF FLIGHT DYNAMICS IN RELATION TO FLIGHT TESTING
H. H. B. M. Thomas *In* AGARD Stability and Control Nov. 1972 13 p refs (For availability see N73-16989 08-02)

It is argued that calculations have an important role to play in the planning of, the conduct of, and the analysis of flight tests. This is especially true of those areas of flight testing which involve maneuvers near limiting flight conditions in which preflight calculations are invaluable in arriving at a clearer definition of the objective of a test. Provided the aerodynamic forces acting on the aircraft can be adequately and reliably represented, there is inherent difficulty about undertaking the solution of the equations of motion in an appropriate number of degrees of freedom with the aid of available digital computers. The real problem, therefore, lies in reducing to a manageable form the output of such computer studies and thereby achieving a deeper understanding of and a more ready interpretation of the results. As an illustrative example, the longitudinal motion of an aircraft involving an extended angle-of-attack range is considered. Author

N73-17012* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
FLIGHT TEST EXPERIENCE IN AIRCRAFT PARAMETER IDENTIFICATION
Chester H. Wolowicz, Kenneth W. Iliff, and Glenn B. Gilyard *In* AGARD Stability and Control Nov. 1972 13 p refs (For availability see N73-16989 08-02)

An automatic method for determining stability and control derivatives from flight data is presented. The technique, a modification of the Newton-Raphsom method for derivative extraction, has a priori provision that makes use of initial estimates of the derivatives and provides a means of checking the validity of the results. Recommendations for applications of the method are included. Author

N73-17013 Aerospatiale Usines de Toulouse (France).
UTILIZATION OF BLACK BOXES FOR IMPROVING THE CHARACTERISTICS OF PILOTAGE DURING THE AIRCRAFT DEVELOPMENT PHASE [UTILISATION DES BOITES NOIRES POUR AMELIORER LES CARACTERISTIQUES DE PILOTAGE DURANT LA PHASE DE DEVELOPPEMENT D'UN AVION]
R. Deque *In* AGARD Stability and Control Nov. 1972 12 p In FRENCH (For availability see N73-16989 08-02)

Problems encountered while trying to modify the flight control system of the Concorde aircraft during the development phase are reported. They are: (1) tendency of pilot engine to pump in a lateral direction during supersonic flight, (2) consecutive skid with motor breakdown at supersonic speed, and (3) control of the aircraft after cut off of the piloting gear. The modifications made to correct these problems are given. Transl. by E.H.W.

N73-17014*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
STUDY OF BUOYANCY SYSTEMS FOR FLIGHT VEHICLES
C. Dewey Havill and Louis J. Williams Washington Dec. 1972 62 p refs
(NASA-TM-X-62168) Avail: NTIS HC $5.25 CSCL 01B

The performance potential of buoyant systems and flexible structures used in air vehicles for short-haul passenger transportation is discussed. The study was intended only to determine if sufficient performance potential existed, and to provide a focus for a more extensive design study, if such a study appeared desirable. A relatively conventional helium system was examined along with a more unusual configuration employing hot-air as the buoyant fluid. Both configurations were examined in the VTOL and STOL modes of operation. The helium system appears to have some superiority in the VTOL mode, while the hot-air system has a superiority in the STOL mode. Both configurations exhibit sufficient performance potential to suggest that a much more extensive design study might well be undertaken. Author

N73-17015*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A PILOTED SIMULATION STUDY OF THE EFFECTS OF CONTROLLER FORCE GRADIENT IN VTOL HOVERING FLIGHT
Emmett B. Fry, Ronald M. Gerdes, and Laurel G. Schroers Jan. 1973 35 p refs Prepared in cooperation with Army Air Mobility Res. and Develop. Lab., Moffett Field, Calif.

(NASA-TM-X-62230) Avail: NTIS HC $3.75 CSCL 01B

A study of the effect of control force gradient on the VTOL visual hovering task was conducted on the NASA-Ames Research Center Six-Degree-of-Freedom Motion Simulator. Lateral control force-gradient characteristics were evaluated in combination with three different types of stabilization systems: An unstabilized (acceleration) system, a rate-stabilized system, and two attitude-stabilized systems. The effects of gust disturbances were included in the control force evaluation for the attitude systems. A force gradient of 1.0 lb/in was within the optimum range for all control systems and conditions evaluated in this study. Author

N73-17016*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

APPLICATION OF MODERN CONTROL THEORY TO THE DESIGN OF OPTIMUM AIRCRAFT CONTROLLERS

Leo J. Power Jan. 1973 12 p refs

(NASA-TM-X-62208) Avail: NTIS HC $3.00 CSCL 01B

The synthesis procedure presented is based on the solution of the output regulator problem of linear optimal control theory for time-invariant systems. By this technique, solution of the matrix Riccati equation leads to a constant linear feedback control law for an output regulator which will maintain a plant in a particular equilibrium condition in the presence of impulse disturbances. Two simple algorithms are presented that can be used in an automatic synthesis procedure for the design of maneuverable output regulators requiring only selected state variables for feedback. The first algorithm is for the construction of optimal feedforward control laws that can be superimposed upon a Kalman output regulator and that will drive the output of a plant to a desired constant value on command. The second algorithm is for the construction of optimal Luenberger observers that can be used to obtain feedback control laws for the output regulator requiring measurement of only part of the state vector. This algorithm constructs observers which have minimum response time under the constraint that the magnitude of the gains in the observer filter be less than some arbitrary limit. Author

N73-17017*# Massachusetts Inst. of Tech., Cambridge. Aeroelastic and Structures Research Lab.

THE NONLINEAR INSTABILITY IN FLAP-LAG OF ROTOR BLADES IN FORWARD FLIGHT

Pin Tong Oct. 1971 67 p refs

(Contract NAS2-6175)

(NASA-CR-114524; ASRL-TR-166-2) Avail: NTIS HC $5.50 CSCL 01C

The nonlinear flap-lag coupled oscillation of torsionally rigid rotor blades in forward flight is examined using a set of consistently derived equations by the asymptotic expansion procedure of multiple time scales. The regions of stability and limit cycle oscillation are presented. The roles of parametric excitation, nonlinear oscillation, and forced excitation played in the response of the blade are determined. Author

N73-17018# National Transportation Safety Board, Washington, D.C.

AIRCRAFT ACCIDENT REPORT. PAN ALASKA AIRWAYS, LTD., CESSNA 310C, N1812H MISSING BETWEEN ANCHORAGE AND JUNEAU, ALASKA, 16 OCTOBER 1972

31 Jan. 1973 26 p refs

(NTSB-AAR-73-1) Avail: NTIS HC $3.50

A Cessna 310C disappeared on a flight from Anchorage to Juneau, Alaska, on October 16, 1972. In addition to the pilot, three passengers, including two U. S. Congressman, were aboard the aircraft. After takeoff from Anchorage, the pilot filed a Visual Flight Rules flight plan for the flight to Juneau. The weather conditions along the proposed route were not conducive to flight under Visual Flight Rules criteria. An extensive air, sea, and land search was conducted during the 39 day period following October 16, 1972. Nothing was found that could be identified with either the aircraft or its occupants. The probable cause of this accident, from the evidence presently available, is undetermined. Author

N73-17019# Cranfield Inst. of Technology (England). Coll. of Aeronautics.

AEROPLANE DESIGN STUDY STOL AIRLINER (A71). PART 1: CONFIGURATION DESCRIPTION AND DATA

D. Howe and R. E. Ward Jun. 1972 32 p refs

(Cranfield-Aero-12-Pt-1) Avail: NTIS HC $3.75

The proposed design of a short takeoff and landing aircraft for short haul passenger operation is presented. The low speed lift and control problems of a short takeoff aircraft are investigated. The aerodynamic configurations and predicted performance of the aircraft are described. Author

N73-17020*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

VERTICAL MOTION REQUIREMENTS FOR LANDING SIMULATION

Richard S. Bray Feb. 1973 24 p

(NASA-TM-X-62236) Avail: NTIS HC $3.25 CSCL 01B

Tests were conducted to determine the significance of vertical acceleration cues in the simulation of the visual approach and landing maneuver. Landing performance measures were obtained for four subject pilots operating a visual landing simulation device which provides up to plus or minus 40 feet of vertical motion. Test results indicate that vertical motion cues are utilized in the landing task, and that they are particularly important in the simulation of aircraft with marginal longitudinal handling qualities. To assure vertical motion cues of the desired fidelity in the landing tasks, it appears that a simulator must have excursion capabilities of at least plus or minus 20 feet. Author

N73-17021*# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

THE DESIGN OF STABILITY AUGMENTATION SYSTEMS FOR DECOUPLING AIRCRAFT RESPONSES Ph.D. Thesis - Purdue Univ. Final Report, Jan. 1970 - Dec. 1971

Rhall E. Pope Jun. 1972 154 p refs Sponsored in part by NASA

(AF Proj. 8219)

(NASA-CR-130543; AD-747017; AFFDL-TR-72-63) Avail: NTIS HC $9.75 CSCL 01/3

Tactical aircraft with STOL capability exhibit undesirable coupled response during the landing phase of flight. A simplified method for designing a stability augmentation system which eliminates the coupling effects is demonstrated. The method is based on Gilbert's decoupling theory which utilizes a feedback control law to obtain a set of single input, single output subsystems. The augmentation system can be designed to provide either command rate or command angle authority in the three rotational axes. Analyses is facilitated through the use of two computer programs, the first of which determines the class of control laws which will decouple a system. The second computer program determines, through transient response analysis, the values of the transfer function parameters required to satisfy response criteria. The results of a piloted simulation which analyzed several decoupled configurations is also presented. Author (GRA)

N73-17022# Aerospace Corp., El Segundo, Calif. Systems Engineering Operations.

LOAD MEASUREMENTS IN PARACHUTE CORDS Report for Jun. 1969 - Oct. 1971

Heinrich K. Epple, Wilbur A. Garber, John P. Jones, Seichi Okubo, and John H. Clow 20 Nov. 1972 35 p refs

(Contract F04701-72-C-0073)

(AD-751913; TR-0073(3410-01)-1; SAMSO-TR-72-255) Avail: NTIS CSCL 01/3

An experimental program to study feasibility of using lightweight transmitting load cell to measure parachute cord loads during parachute opening and steady descent state described. The load cell consists of an aluminum tube incorporating a pair of semiconductor strain gages that are used to frequency modulate a 10 mW transmitter operating at a carrier frequency of 228 MHz. The program included a laboratory test program followed by flight tests with the load cell installed in a parachute cord. Author (GRA)

N73-17023# Naval Air Engineering Center, Philadelphia, Pa. Engineering Dept.

ENVIRONMENTAL TEMPERATURE AND AIRCRAFT COMPATIBILITY STUDIES

G. Gaeman and W. Goon Oct. 1972 78 p refs

(AD-752018; NAEC-ENG-7780) Avail: NTIS CSCL 01/3

A study of both landbased and shipboard tests of the F14A aircraft with the MK7 Jet Blast Deflector to investigate the effect of backflow of jet exhaust on the aircraft being launched and the resulting environmental temperature aft and alongside the JBD. Configuration for shipboard installation and desired mode of operation are recommended. Areas for further effort to achieve improved compatibility are also presented. Author (GRA)

N73-17024# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.

F-111 CRACK-PROPAGATION SENSITIVITY ANALYSES

Neil McManus and Troy T. King Mar. 1972 32 p refs

(AF Proj. 324A)

(AD-752223; ASD-TR-71-89) Avail: NTIS CSCL 01/3

The report presents the results of sensitivity analyses conducted on the F-111 aircraft. The objective of the investigation was to identify and assess those parameters which significantly affect the crack propagation characteristics of high strength steel and to relate these results to the F-111 aircraft. The study was done by parametric analyses, and the results are presented graphically in terms of subcritical crack growth interval versus the independent parameter. The analyses showed where emphasis should be placed to control the parametric variables and to minimize a structural failure caused by a pre-existing flaw. In particular, the greatest variation in crack growth interval was a function of initial flaw size. Author (GRA)

N73-17025# Technology, Inc., Dayton, Ohio.

T-38 STRUCTURAL FLIGHT LOADS DATA FOR JUNE 1970 - DECEMBER 1971 Final Report, 1 Jun. 1970 - 31 Mar. 1972

Larry E. Clay and Ronald I. Rockafellow Wright-Patterson AFB, Ohio ASD Jun. 1972 149 p refs

(Contracts F33657-70-D-1161; F33657-71-C-0662)

(AD-751968; ASD-TR-72-54) Avail: NTIS CSCL 01/3

In a fifth part of a continuing T-38 Service Loads Recording Program to cover the period from 1 June 1970 through 31 December 1971, 4265 hours of VGH data were recorded by A/A24U-10 magnetic tape recording systems installed in twenty-eight T-37 aircraft: 22 fleet and 6 lead-the-force T-38's operating from Williams, Reese, and Moody Air Force Bases. As in previous reports, the data presentation includes curves showing normal load factor (nz) exceedances above each nz level per thousand flight hours. Only one (nz) exceeded 7.8 (design limit is 7.33), and the comparison of the exceedance curves for the current and previous programs substantiated that the T-38 (nz) spectrum had remained unchanged during the T-38 SLRP. Author (GRA)

N73-17026# Hughes Aircraft Co., Culver City, Calif. Engineering Equipment Div.

STUDY OF A HIGHLY RELIABLE PILOT'S VERTICAL DISPLAY SYSTEM Final Report, 8 Jun. 1970 - 8 Jul. 1972

J. L. Heard, H. L. Bjelland, and E. Streeter Oct. 1972 185 p refs

(Contract N62269-71-C-0510)

(AD-752510; HAC-P72-104R) Avail: NTIS CSCL 01/3

The study develops the requirements for a highly reliable cathode ray tube type of Vertical Display Systems (VDS) for use in Advanced Navy All-Weather Aircraft of the 1980's. First the operational requirements study identified the detailed information required for the VDS. The performance requirements section converts the general operational requirements into specific mechanization requirements. Mechanization tradeoffs then evaluate specific candidate designs and selects the optimum design mechanization for the VDS. A reliability analysis is also performed and aids in making the hardware tradeoffs. A TV type (resonant) indicator is selected to be optimum for the VDS application along with an in-raster or digital television symbol generator. Also two candidate digital scan converter PPI to TV mechanizations are recommended for further evaluation.

Author (GRA)

N73-17027# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.

TEST PLAN FOR NON-DESTRUCTIVE INSPECTION INVESTIGATION OF THE CATAPULT AND ARRESTED LANDING CARRY-THROUGH STRUCTURE OF THE E-2 AIRCRAFT Progress Report

Louis Berman 15 Jul. 1972 11 p

(AD-752492) Avail: NTIS CSCL 01/3

Non-destructive inspection techniques, for utilization by the NAVAIREWORKFAC (Naval Air Rework Facility), are required to inspect the catapult and arrested landing carry-through structure of the E-2 airplane. This program proposes an NDI investigation to be performed during the E-2 fatigue tests. Author (GRA)

N73-17028# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.

TEST PLAN REPORT FOR CATAPULT FATIGUE TEST OF THE MODEL C-2A AIRPLANE

Edward F. Kautz 6 Oct. 1972 19 p refs

(AD-752493; NADC-72197-VT) Avail: NTIS CSCL 01/3

A laboratory fatigue test will be performed on a C-2 airframe to determine whether the airframe will sustain the effects of 3000 catapult launches without structural failure. Author (GRA)

N73-17029# Forest Products Lab., Madison, Wis.

DESIGN PARAMETERS FOR TORSION OF SANDWICH STRIPS HAVING TRAPEZOIDAL, RECTANGULAR, AND TRIANGULAR CROSS SECTIONS

H. M. Montrey and Edward W. Kuenzi 1972 41 p refs Sponsored by Air Force and FAA

(AD-752619; FSRP-FPL-156) Avail: NTIS CSCL 01/3

Solutions for the elastic torsion of sandwich strips having triangular, rectangular, or trapezoidal cross sections are presented analytically in terms of suitable design parameters. Data obtained from resulting expressions are presented in a series of design curves for normalized values of torsional stiffness and maximum facing and core shear stresses. The analysis is based on the Saint Venant theory of torsion. The sandwich facings are idealized as identical, thin, isotropic membranes, while the core's elastic behavior is characterized by a single transverse modulus of rigidity. Author (GRA)

N73-17030# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.

BI-NORMAL COORDINATES IN DISCRETE SYSTEMS WITH APPLICATION TO AN AIRCRAFT SHIMMY PROBLEM

Lynn C. Rogers Jun. 1972 265 p refs

(AF Proj. 1367)

(AD-752548; AFFDL-TR-72-79) Avail: NTIS CSCL 01/3

The use of bi-normal coordinate theory in the analysis of practical discrete systems provides the substantial benefits of conceptual value/physical insight, computational utility, and enhanced redesign capability. These benefits are explained and demonstrated in the present effort with attention to practical considerations. Section 1 extends the theory and presents the new material together with some previously available results in a coordinated manner. In particular, the nature of response in a single homogenous phasor mode is described in detail. Also, an expression for the derivative of an eigenvalue is developed and explained. Section 2 reports the analysis of an aircraft nosegear shimmy problem using bi-normal coordinate methods. Stability boundaries, mode shapes, and sensitivities to parameter changes are presented. Derivatives of eigenvalues are used in Section 3 to illustrate automated minimum weight design for a shimmy-free nosegear. Recommendations for further research are made. Author (GRA)

N73-17031# Boeing Co., Philadelphia, Pa. Vertol Div.

AN INVESTIGATION OF HELICOPTER TRANSMISSION NOISE REDUCTION BY VIBRATION ABSORBERS AND DAMPING Final Report

H. Sternfeld, J. Schairer, and R. Spencer Ft. Eustis, Va. Army Air Mobility Res. and Develop. Lab. Aug. 1972 163 p refs

(Contract DAAJ02-71-C-0020; DA Proj. 1F1-62204-A-142)

(AD-752579; USAAMRDL-TR-72-34) Avail: NTIS CSCL 01/3

A test program was conducted to evaluate the effect of dynamic absorbers and damping on the noise generated by a CH-47 rotor transmission. Comparison was made between predicted and measured results, and a method for comparing the efficiency of various methods of transmission noise reduction was developed. Gear damping was achieved by filling the gear

shafts with Viton, and by a ring of Viton on the spiral bevel ring gear. Constrained layer damping was also used on the outside of the planetary ring gear. Author (GRA)

N73-17032# Massachusetts Inst. of Tech., Cambridge. Aerophysics Lab.
HELICOPTER ROTOR WAKE GEOMETRY AND AIRLOADS AND HELICOPTER ROTOR WAKES Final Scientific Technical Report, 6 Jun. 1971 - 6 Jun. 1972
M. P. Scully and J. P. Sullivan Aug. 1972 67 p refs
(Contract N00019-71-C-0220; MIT Proj. DSR-73032)
(AD-752628; TR-179) Avail: NTIS CSCL 14/2

Computer programs have been developed for the calculation of helicopter rotor tip vortex geometry in hover and forward flight and for the calculation of helicopter rotor harmonic airloads in forward flight. Calculated forward flight tip vortex geometries compare well in general with experimental smoke studies although there are differences in detail. The hovering tip vortex geometry agrees qualitatively with experiment but does not move downward fast enough. Airloads were computed using both the classical rigid wake assumption and the distorted tip vortex geometry obtained from the computer program. When compared with experimental airloads measurements the rigid wake airloads give better results than the distorted wake airloads. Author (GRA)

N73-17033# Northrop Corp., Hawthorne, Calif. Aircraft Div.
V/STOL AIRCRAFT AERODYNAMIC PREDICTION METHODS INVESTIGATION. VOLUME 1: THEORETICAL DEVELOPMENT OF PREDICTION METHODS Final Report, 1 May 1969 - 31 Jan. 1972
Peter T. Wooler, Hsiao C. Kao, Myles F. Schwendemann, Howard R. Wasson, and Henry Ziegler Jan. 1972 238 p refs
(Contract F33615-69-C-1602; AF Proj. 6988T)
(AD-752557; NOR-72-9-Vol-1; AFFDL-TR-72-26-Vol-1) Avail: NTIS CSCL 01/3

Analytical engineering methods are developed for use in predicting the static and dynamic stability and control derivatives and force and moment coefficients of lift-jet, lift-fan, and vectored thrust V/STOL aircraft in the hover and transition flight regimes. The methods take into account the strong power effects, large variations in angle of attack and sideslip, and changes in aircraft geometry that are associated with high disk loaded V/STOL aircraft operating in the aforementioned flight regimes. The theoretical development of the prediction methods is presented in this volume. Author (GRA)

N73-17034# Northrop Corp., Hawthorne, Calif. Aircraft Div.
V/STOL AIRCRAFT AERODYNAMIC PREDICTION METHODS INVESTIGATION. VOLUME 2: APPLICATION OF PREDICTION METHODS Final Report, 1 May 1969 - 31 Jan. 1972
Peter T. Wooler, Hsiao C. Kao, Myles F. Schwendemann, Howard R. Wasson, and Henry Ziegler Jan. 1972 249 p refs
(Contract F33615-69-C-1602; AF Proj. 6988T)
(AD-752558; NOR-72-9-Vol-2; AFFDL-TR-72-26-Vol-2) Avail: NTIS CSCL 01/3

Analytical engineering methods are developed for use in predicting the static and dynamic stability and control derivatives and force and moment coefficients of lift-jet, lift-fan, and vectored thrust V/STOL aircraft in the hover and transition flight regimes. The aircraft configurations studied have a conventional wing, fuselage and empennage. The prediction methods are applied to a number of V/STOL configurations in this volume. Author (GRA)

N73-17035# Northrop Corp., Hawthorne, Calif. Aircraft Div.
V/STOL AIRCRAFT AERODYNAMIC PREDICTION METHODS INVESTIGATION. VOLUME 3: MANUAL FOR COMPUTER PROGRAMS Final Report, 1 May 1969 - 31 Jan. 1972
Peter T. Wooler, Hsiao C. Kao, Myles F. Schwendemann, Howard R. Wasson, and Henry Ziegler Jan. 1972 207 p
(Contract F33615-69-C-1602; AF Proj. 6988T)
(AD-752559; NOR-72-9-Vol-3; AFFDL-TR-72-26-Vol-3) Avail: NTIS CSCL 01/3

Analytical engineering methods are developed for use in predicting the static and dynamic stability and control derivatives and force and moment coefficients of lift-jet, lift-fan, and vectored thrust V/STOL aircraft in the hover and transition flight regimes. The aircraft configurations studies have a conventional wing, fuselage and empennage. The prediction methods are suitable for use by design personnel during the preliminary design and evaluation of V/STOL aircraft of the type previously mentioned. Details and listings of the computer programs associated with the prediction methods are given in the volume. Author (GRA)

N73-17036# Northrop Corp., Hawthorne, Calif. Aircraft Div.
V/STOL AIRCRAFT AERODYNAMIC PREDICTION METHODS INVESTIGATION. VOLUME 4: LITERATURE SURVEY Final Report, 1 May 1969 - 31 Jan. 1972
Peter T. Wooler, Hsiao C. Kao, Myles F. Schwendemann, Howard R. Wasson, and Henry Ziegler Jan. 1972 79 p refs
(Contract F33615-69-C-1602; AF Proj. 6988T)
(AD-752563; NOR-72-9-Vol-4; AFFDL-TR-72-26-Vol-4) Avail: NTIS CSCL 01/3

Analytical engineering methods are developed for use in predicting the static and dynamic stability and control derivatives and force and moment coefficients of lift-jet, lift-fan, and vectored thrust V/STOL aircraft in the hover and transition flight regimes. The prediction methods are suitable for use by design personnel during the preliminary design and evaluation of V/STOL aircraft of the type previously mentioned. The results of a literature survey are presented in this volume. Author (GRA)

03 AUXILIARY SYSTEMS

Includes fuel cells, energy conversion cells, and solar cells; auxiliary gas turbines, hydraulic, pneumatic and electrical systems; actuators; and inverters. For related information see also: 09 Electronic Equipment; Nuclear Engineering; and 28 Propulsion Systems.

N73-17037*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
BATTERY TESTING DEVICE Patent Application
William A. Boshers, inventor (to NASA) Filed 24 Jan. 1973 11 p
(NASA-Case-MFS-20761-1; US-Patent-Appl-SN-326327) Avail: NTIS HC $3.00 CSCL 10C

A device for testing all cells of a multi-cell battery without using mechanical connectors is described. The device consists of testing prongs which are adjustable both vertically and laterally to permit simultaneous contact with all of the battery connecting straps. Each probe assembly contains a plunger which is electrically connected to an instrument to measure the condition of each cell. NASA

N73-17038*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
HEAT-STERILIZED SILVER OXIDE-ZINC CELLS: CYCLE LIFE STUDIES
J. T. Arms 1 Jan. 1973 26 p ref
(Contract NAS7-100)
(NASA-CR-130723; JPL-TM-33-581) Avail: NTIS HC $3.50 CSCL 10C

A JPL study was conducted to evaluate the cell design parameters that contribute to the cycle life of sealed, heat-sterilized silver oxide-zinc cells. Test cells having a rated capacity of 4.2 A-h were fabricated using zinc oxide electrodes prepared by the sintered Teflon process. Two separator variations were evaluated, one having acrylic acid and the other methacrylic acid grafted to irradiated polyethylene film. Significant results of this study include the following: (1) cycle life in excess of 300 cycles was attained; (2) a zinc oxide/silver stoichiometric ratio of 1.5 resulted in greater cycle life than a ratio of 1.1, and similar cycle life to cells having a ratio of 2; (3) cells having methacrylic acid grafted separators suffered somewhat less in capacity loss due to zinc electrode shape change than cells having acrylic acid type; (4) use of acrylic acid grafted separators was slightly superior to the methacrylic acid type in respect to silver penetration; and (5) the inclusion of a layer of potassium titanate paper adjacent to the zinc electrodes resulted in cells that achieved higher cycle

life before any of the group failed than that reached by cells of any other construction. Author

N73-17039*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF REDUCING ROTOR BLADE INLET DIAMETER ON THE PERFORMANCE OF A 11.66-CENTIMETER RADIAL-INFLOW TURBINE
Milton G. Kofskey and Jeffrey E. Haas Washington Mar. 1973 20 p refs Prepared in cooperation with Army Air Mobility R and D Lab., Cleveland, Ohio
(NASA-TM-X-2730; E-7119) Avail: NTIS HC $3.00 CSCL 21E

The effect of increased rotor blade loading on turbine performance was investigated by reducing rotor blade inlet diameter. The reduction was made in four stages. Each modification was tested with the same stator using cold air as the working fluid. Results are presented in terms of equivalent mass flow and efficiency at equivalent design rotative speed and over a range of pressure ratios. Internal flow characteristics are shown in terms of stator exit static pressure and the radial variation of local loss and rotor-exit flow angle with radius ratio. Included are velocity diagrams calculated from the experimental results. Author

N73-17040*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
EVALUATION OF NEW PLASTIC COMPRESSION (ZIEGLER) TYPE OF SEALS FOR LONG LIFE PLANETARY BATTERIES
H. A. Frank 1 Feb. 1973 37 p refs
(Contract NAS7-100)
(NASA-CR-130867; JPL-TM-33-588) Avail: NTIS HC $4.00 CSCL 10C

A program was initiated to develop improved types of terminal seals for aerospace Ni-Cd batteries. The approach used has not involved attempts, such as employed elsewhere, to improve the ceramic-to-metal seal that is now extensively employed for this application. Rather the approach has been directed toward the development and evaluation of new types of seals. Of prime interest in this initial investigation has been the Ziegler type of compression seal and in particular the injection molded version developed by the Bell Telephone Laboratories (BTL). A number of these units were designed, fabricated, and evaluated on an accelerated life test under a simulated battery environment. Results have shown that there are no major problems involved in scaling up the BTL small-size (5-amp) seal to a larger size (up to 50-amp) seal suitable for most JPL flight batteries. Five out of five such seals successfully completed over 10 months of continuous thermal cycling without developing any leaks greater than 1.8 x to 10 to the minus 9th power atm-cc-He/s. Author

N73-17041# Oak Ridge National Lab., Tenn. Reactor Div.
REVIEW OF DEVELOPMENT STATUS OF SMALL TURBINE-GENERATOR UNITS SUITABLE FOR THE NAVY UNDERSEA POWER PLANT
A. P. Fraas Sep. 1972 31 p refs
(Contract W-7405-eng-26)
(ORNL-TM-3586) Avail: NTIS

The development status of small turbine and engine generator units that might be used with isotope power sources for undersea applications requiring from 2 to 10 kW(e) is reviewed. Drawings, performance data, and operational problems are included. Author (NSA)

N73-17042# Sundstrand Aviation-Rockford, Ill.
EVALUATION AND ENDURANCE, 6 KW SYSTEM
R. E. Niggemann 8 Sep. 1972 90 p
(Contract AT(04-3)-651)
(SAN-651-130; AER-659) Avail: NTIS

Results for performance and endurance testing of a 6-kW(e) organic Rankine cycle power conversion system are presented. The system was developed for converting heat energy from vaporized Dowtherm A to electric energy and for pumping fluids to add and remove heat from the system. This machinery comprises a turbine, electric alternator, and vaporizer feed pump on an integral shaft. Performance data with Dowtherm A working fluid were obtained for the following test conditions: 650 F turbine inlet temperature and 0.5 psia turbine back pressure using both surface condenser and jet condenser; 700 F turbine inlet temperature and 0.5 psia turbine back pressure using jet condenser; and endurance testing for 3000 hr at 700 F turbine inlet temperature using jet condenser. Performance measurements indicate that with reworked regenerators, and in the case of the jet condenser configuration, with a pump designed for the specific operating conditions, both systems would produce a system efficiency of over 17%. NSA

N73-17043# California Univ., Berkeley. Lawrence Berkeley Lab.
INVESTIGATION OF THE BEHAVIOR OF GRAPHITE ELECTRODES IN NONAQUEOUS ELECTROLYTES
Juergen Besenhard and Heinz P. Fritz Apr. 1972 14 p refs Transl. into ENGLISH from Z. Naturforsch. (West Germany), 26b, 1971 p 1225-1229 Sponsored by AEC
(UCRL-Trans-1476) Avail: NTIS

The behavior of graphite electrodes in organic electrolytes (e.g. LiC104 in propylene carbonate) was investigated by potentiostatic and galvanostatic measurements. Strongly oxidizing products are obtained by electrochemical oxidation of graphite in such electrolytes. This reaction shows good reversibility and charge efficiency. The results indicate the existence of graphite intercalation compounds. Author

N73-17044# Westinghouse Electric Corp., Lima, Ohio. Aerospace Electrical Div.
HIGH TEMPERATURE GENERATOR COMPONENT DEVELOPMENT Final Report, May - Sep. 1972
Robert C. Fear, Alan E. King, and W. S. Neff Sep. 1972 158 p refs
(Contract F33615-72-C-1626; AF Proj. 3145)
(AD-752604; WAED-72-13E; AFAPL-TR-72-89) Avail: NTIS CSCL 10/2

A selective investigation and study effort of generator designs, insulations, magnetic materials, diodes, and rotor bonding for operation in a 600F ambient is described. Also described is the disassembly and examination of a 5 KVA generator built on a previous program. These efforts lead to the recommendation of a wound rotor generator configuration for development of a 60 KVA, 600F generator. Author (GRA)

N73-17045# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF STRESS STRAIN MODELS FOR ENERGY-STORING SYSTEMS
John McCallum, Ralph E. Thomas, and Earl A. Roeger, Jr. Wright-Patterson AFB, Ohio AFAPL Aug. 1972 126 p refs
(Contract F33615-69-C-1537)
(AD-752257; AFAPL-TR-72-68) Avail: NTIS CSCL 10/3

The report is an attempt to arrive at a useful stress-strain model for batteries. The first objective is to formulate and justify the meaning of stress and strain and similar concepts related to the performance and aging of batteries. A second objective is to formulate mathematical relationships for various combinations of springs, dashpots, and their analogs. A third objective is to associate specific processes and components in a battery with one or more models growing out of results from objectives 1 and 2. In attempting to reach the first objective it seemed necessary to consider the general meaning of stress, strain, force, displacement, strain-rate, and acceleration, for individual forms of energy. The report expands on the generalized meaning of stress and strain for six forms of energy: (1) mechanical energy, (2) surface energy, (3) volume expansion energy, (4) electrical energy, (5) thermal energy, and (6) chemical energy. GRA

N73-17046# Garrett Corp., Phoenix, Ariz. AiResearch Manufacturing Div.
A SECONDARY POWER SYSTEM STUDY FOR ADVANCED ROTARY-WING AIRCRAFT Final Technical Report, 1 Jun. 1970 - 31 May 1971
Bernard H. Nicholls Aug. 1972 335 p
(Contract DAAJ02-70-C-0048; DA Proj. 1G1-62203-D-144)
(AD-751854; SY-6103-R; USAAMRDL-TR-72-13) Avail: NTIS CSCL 10/2

A study was performed to define and evaluate secondary power systems for an advanced Army rotary-wing aircraft, using existing technology and two advanced technology levels. The

basic aircraft mission, performance penalty parameters, and system components are defined. From a total of 162 candidate systems, 36 were selected for detailed comparisons. Evaluation parameters included incremental takeoff gross weight, system weight, volume, reliability, maintainability, availability, power APU that drives into the aircraft accessory gearbox with two electrical generators and two hydraulic pumps. Main engines are started pneumatically by bleed air from the APU. Cockpit cooling was an optional addition, and an air-cycle system was selected. Author (GRA)

04 BIOSCIENCES

Includes aerospace medicine, exobiology, radiation effects on biological systems; physiological and psychological factors. For related information see also: 05 Biotechnology.

N73-17047*# Research Triangle Inst., Research Triangle Park, N.C.

APPLICATIONS OF AEROSPACE TECHNOLOGY IN BIOLOGY AND MEDICINE Final Report, Sep. 1971 - Aug. 1972

F. T. Wooten 31 Aug. 1972 124 p

(Contract NASw-2273)

(NASA-CR-130544) Avail: NTIS HC $8.25 CSCL 06E

The results are presented of the medically related activities of the NASA Application Team Program at the Research Triangle Institute. The accomplishments of the Research Triangle Institute Application Team during the reporting period are as follows: The team has identified 44 new problems for investigation, has accomplished 8 technology applications and 8 potential technology applications, has closed 88 old problems, and reactivated 3 old problems, and on August 31, 1972, has a total of 57 problems under active investigation. Author

N73-17048*# National Aeronautics and Space Administration, Washington, D.C.

PROCEEDINGS OF THE ANNUAL CONFERENCE OF NASA CLINIC DIRECTORS, ENVIRONMENTAL HEALTH OFFICIALS AND MEDICAL PROGRAM ADVISORS

1969 169 p refs Conf. held at New Orleans, 21-23 Oct. 1969

(NASA-TM-X-69072) Avail: NTIS HC $10.50 CSCL 06E

The current status of the NASA Occupational Medicine and Environmental Health Program is discussed with emphasis on periodic physical examinations and continuous updating of medical history questionnaires for preventing health and emotional problems. For individual titles, see N73-17049 through N73-17063.

N73-17049* Radio Corp. of America, Camden, N.J.

APOLLO 11 IMPACT ON THE OCCUPATIONAL MEDICINE PROGRAM, NASA MANNED SPACECRAFT CENTER

Paul E. Wright *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 1-3 (For availability see N73-17048 08-04)

(Contract NAS9-6568)

CSCL 06I

Requirements and development of standards for occupational medicine support of personnel in the Lunar Receiving Laboratory (LRL) are outlined. Considered are proper personnel performance and exclusion of people prone to develop a serious illness within the quarantine area. Occupational medicine report for the LRL consists of examination procedures covering laboratory work, periodic examinations, immunizations, health maintenance, preventive practices, medical standards, and waiver authority. G.G.

N73-17050* National Aeronautics and Space Administration, Washington, D.C.

MEDICAL EXAMINATIONS FOR RADIATION WORKERS

R. E. Alexander *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 4-9 refs (For availability see N73-17048 08-04)

CSCL 04R

The NASA radiological protection policy allows an employee to be assigned work in a radiologically controlled area only if all of the following conditions are met: (1) The area must be radiologically safe for the intended operations; (2) the employee must be medically fit; (3) the employee must be properly trained; (4) appropriate radiation protection procedures must be prepared; (5) appropriate dosimetric, survey, surveillance and reporting procedures must be implemented; and (6) adequate controls and records must be established. Author

N73-17051* Cox Coronary Heart Inst., Dayton, Ohio.

EXPERIENCES WITH PHYSICAL CONDITIONING PROGRAMS IN MIDDLE-AGED MEN

Benjamin Schuster and Edwin Stanley *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 10-15 (For availability see N73-17048 08-04)

CSCL 06P

Long term effects of physical exercise and conditioning in the prevention and treatment of coronary heart disease are studied. Some aspects of the problem are outlined and difficulties encountered in a group of middle aged business executives using a carefully prescribed, but non-regimented and loosely supervised conditioning program employing commonly used forms of exercise (bicycling and jogging), are described. Author

N73-17052* National Aeronautics and Space Administration, Washington, D.C.

EXPERIENCE FACTORS IN PERFORMING PERIODIC PHYSICAL EVALUATIONS

Archie A. Hoffman *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 16-22 refs (For availability see N73-17048 08-04)

CSCL 06P

The lack of scientific basis in the so-called periodic health examinations on military personnel inclusive of the Executive Health Program is outlined. This latter program can well represent a management tool of the company involved in addition to being a status symbol. A multiphasic screening technique is proposed in conjunction with an automated medical history questionnaire for preventive occupational medicine methodology. The need to collate early sickness consultation or clinic visit histories with screening techniques is emphasized. Author

N73-17053* Texas Univ., San Antonio. Medical School.

STABILITY OF HUMAN SERA COLLECTED FOR CLINICAL CHEMISTRY DETERMINATIONS

Frank M. Townsend *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 23-25 (For availability see N73-17048 08-04)

CSCL 06P

Problems in collecting and shipping human sera for clinical chemical analyses affect their stability and require proper preservation methods. It is shown that glutamic pyruvate transaminase is very unstable and serum cannot be shipped unless the shipping time is carefully controlled and is less than two days under refrigeration. A limit of four days handling time and avoidance of light exposure are required in bilirubin testing of specimens. Addition of 11 mg of a 10 to 1 mixture of finely powdered sodium fluoride and thymol per ml of blood to preserve specimen stability en route to a central laboratory prevents glycolysis. A citrate buffer at pH 6.2 in serum to be tested for alkaline phosphatase lessens decline at room temperature. G.G.

N73-17054* Michigan Univ., Ann Arbor. Inst. for Social Research.

PSYCHOSOCIAL FACTORS IN CORONARY HEART DISEASE

John R. P. French, Jr. and Robert D. Chaplan *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 26-72 refs (For availability see N73-17048 08-04)

CSCL 06E

The relationship between job satisfaction and coronary heart disease is explored for blue and white collar groups, different personalities and physiological risk factors. Differences found among administrators, engineers and scientists with regard to

variables associated with heart disease are in terms of physiology, personality, reported job stress, and smoking. G.G.

N73-17055* National Aeronautics and Space Administration, Washington, D.C.

LEAVE TAKING AND OVERTIME BEHAVIOR AS RELATED TO DEMOGRAPHIC, HEALTH, AND JOB VARIABLES

Louis B. Arnoldi and John C. Townsend *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 73-94 (For availability see N73-17048 08-04)

CSCL 06P

An intra-installation model is formulated that correlates demographic, health and job related variables to the various types and amounts of leave and overtime taking behavior of employees. Statistical comparison of composite health ratings assigned to subjects based upon clinical criteria and bio-statistical data show that those employees who take the most annual leave as well as sick leave are the ones that have the poorest health ratings; employees who put in the most overtime have also the poorest health records. Stress effects of peak activity periods increase use of sick leave immediately after peak activity but not the use of annual leave. G.G.

N73-17056* National Aeronautics and Space Administration, Washington, D.C.

ENVIRONMENTAL HEALTH PROGRAM IN NASA

Rudolph M. Marrazzo *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 95-106 (For availability see N73-17048 08-04)

CSCL 06P

The NASA policy on environmental health uses medical and environmental concepts to: (1) Determine the health status of employees; (2) prevent illness and promote good health among employees; and (3) identify and control factors that affect the health of personnel and quality of environment. Evaluation and control of physical, chemical, radiological and biological factors surrounding personnel and which represent physiological and psychological stresses and impairment are considered. G.G.

N73-17057* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.

ENVIRONMENTAL HEALTH PROGRAM ACTIVITIES

Charles P. Bergtholdt *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 107-110 (For availability see N73-17048 08-04)

CSCL 06P

Activities reported include studies on toxic air contaminants, excessive noise, poor lighting, food sanitation, water pollution, and exposure to nonionizing radiation as health hazards. Formulations for a radiological health manual provide guidance to personnel in the procurement and safe handling of radiation producing equipment and Apollo mission planning. A literature search and development of a water analysis laboratory are outlined to obtain information regarding microbiological problems involving potable water, waste management, and personal hygiene. G.G.

N73-17058* National Academy of Sciences-National Research Council, Washington, D.C.

THE RELATIONSHIP OF NASA OCCUPATIONAL MEDICINE AND ENVIRONMENTAL HEALTH WITH THE ADVISORY CENTER ON TOXICOLOGY

Ralph C. Wands *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 111-116 (For availability see N73-17048 08-04)

CSCL 06T

Preventive measures of occupational medicine and industrial hygiene are coordinated to identify toxicities of industrial products and safety standards in manned space flight applications. Emphasized is the off-gassing of construction materials in spacecraft with the resulting contamination of the cabin atmosphere and the establishment of criteria for the quality of drinking water for astronauts during Gemini and Apollo programs. G.G.

N73-17059* National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.

MACHINING OF LOW PERCENTAGE BERYLLIUM COPPER ALLOYS

John G. Habermeyer *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 117-120 (For availability see N73-17048 08-04)

CSCL 06T

Airborne beryllium sampling during machining of low percentage beryllium-copper alloys shows that normal dry machining creates 45.2 microgram/cu m of airborne beryllium in the casting operators breathing zone and 2.3 microgram/cu m in an adjacent machine working area. A small vacuum system placed over the tool effectively removes airborne beryllium in the breathing zone sample to 0.2 microgram/cu m. G.G.

N73-17060* National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.

PRELIMINARY REPORT ON USE OF LAHEY CLINIC AUTOMATED HISTORY IN AN INDUSTRIAL COMPLEX c05

B. O. Leonardson *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 121-123 (For availability see N73-17048 08-04)

CSCL 05B

A questionnaire has been developed and used extensively as an aid to the appointment office in determining what department a patient should be referred to and what time for special consultations should be reserved. It has helped to maintain a balanced case load and informs the physician in advance about the patients he will see. By coordinating appointments so that the patient can visit two or more of the specialty departments in one day rather than having to return a number of times to see different doctors, it has increased efficiency. The questionnaire screens for important symptoms or trouble spots to which the computer is programmed to assign scoring values which in turn point out the clinic division or section to which the patient should initially be referred. Author

N73-17061* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.

REVIEW OF A SERIES OF PROCTOSIGMOIDOSCOPIES DONE AT WALLOPS STATION, VIRGINIA

Edward White *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 124-126 (For availability see N73-17048 08-04)

CSCL 06E

Routine proctosigmoidoscopic examinations for incidence of polyps in NASA installation asymptomatic personnel establish the value of this method in detecting cancer without invasion beyond the stalk and resulting in curative operation at greater survival rates than in later detections. G.G.

N73-17062* University of Southern Calif., Los Angeles.

SENSITIVITY TO EMOTIONAL ILL HEALTH

Jean Spencer Felton *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 127-156 refs (For availability see N73-17048 08-04)

CSCL 05J

The services of mental specialists, such as psychologists, psychiatrists, or psychiatric social workers are required to assure maximum human performance in Government facilities. Contemporary mental health programming covers emotionally generated problems at operational sites to complete disclaiming of the existence of such difficulties among workers. Frequent taking of sick leave or annual leave when work seems demanding or when a promotion does not materialize, chronic or repeated tardiness, requests for frequent transfers, work over-loading, accidental injuries, and alcoholism are all forms of stress responses and indicate a need for emotional counselling. G.G.

N73-17063* Massachusetts Inst. of Tech., Cambridge.

LABORATORY HOOD DESIGN c05

Richard I. Chamberlin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 157-165 (For availability see N73-17048 08-04)

CSCL 06Q

A supply air hood is described that provides a curtain of

clean air just outside of the hood surface for protection of the operator. The design consists of an overhead plenum which extends out from the hood with tapered sides extending from the plenum to the bench, a slotted baffle plate and two perforated plates with offset holes, dust filters, and a special deflector plate. The latter introduces less than 4 cubic feet flow per minute through the special perforated area so that a sweeping effort is almost always maintained at bench level. Performance tests indicate that even under adverse exhaust conditions some of the supply air may be lost to the room, but none of the air within the hood that represents contaminated flow is entrained or displayed so that it enters the work area. This hood operates with an efficiency of about 90% exhaust for supplied air. G.G.

N73-17064*# National Aeronautics and Space Administration, Washington, D.C.
PROCEEDINGS OF THE ANNUAL CONFERENCE OF NASA CLINIC DIRECTORS, ENVIRONMENTAL HEALTH OFFICIALS AND MEDICAL PROGRAM ADVISORS
1970 184 p refs Conf. held at Cambridge, Mass., 13-15 Oct. 1970
(NASA-TM-X-69073) Avail: NTIS HC $11.25 CSCL 06E

Medical problems common to NASA and aviation industry facilities are discussed. The focus centers on preventive counselling, environmental control, and physical and mental health measures. For individual titles, see N73-17065 through N73-17077.

N73-17065* National Aeronautics and Space Administration, Washington, D.C.
DYNAMIC EKG STUDY
Robert L. Fleck *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 1-4 (For availability see N73-17064 08-04)
CSCL 06E

The use of the dynamic EKG study as a part of periodic health examination is considered to be a valuable complement to other forms of stress testing with its ability to detect abnormal heart responses to stress stimuli. It is believed that statistical correlations of dynamic EKG findings with physical examination results contribute greatly to the understanding of cardiac abnormalities. Author

N73-17066* National Aeronautics and Space Administration, Washington, D.C.
NORMALLY EXPECTED ABERRATIONS IN THE 8-HOUR DYNAMIC EKG
Robert L. Fleck, Louis B. Arnoldi, John C. Townsend, and Xenia Tonesk *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 5-17 (For availability see N73-17064 08-04)
CSCL 06E

The establishment of norms for interpreting long term dynamic electrocardiograms is attempted by correlating a completely disease-symptom- and cardiac risk factor-free sample with a non-pure sample in the direction of normality on various variables. Out of a population of 362 subjects exposed to dynamic electrocardiogram testing, a discrimination between normals and abnormals in terms of traditional risk factors was observed. The two groups differed significantly on the following variables: cholesterol, smoking, systolic blood pressure, white blood count, fasting blood sugar, uric acid, resting EKG, year of birth, and coronary insufficiency. G.G.

N73-17067* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
AN EXERCISE PRESCRIPTION INTERVENTION PROGRAM WITH PERIODIC ERGOMETRIC GRADING
Cannon A. Owen and Earl F. Beard *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 18-38 refs (For availability see N73-17064 08-04)
CSCL 06E

A long term exercise prescription type of physical conditioning program has been available to executive personnel of the NASA Manned Spacecraft Center for the past two years. Periodic ergometric testing with a heart rate controlled, automatically programmed, bicycle ergometer is used to follow the individual's progress and appropriately alter his exercise prescription from time to time. Such a program appears feasible, and acceptance is excellent, dropout rates small and periodic testing participation good. Subjects training diligently can maintain satisfactory levels of conditioning. Author

N73-17068* National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
MEDICAL AUTOMATION SYSTEM AT THE MARSHALL SPACE FLIGHT CENTER
James H. Spraul *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 39-51 (For availability see N73-17064 08-04)
CSCL 06E

A computer system is reported for scheduling and coordinating physical examinations for groups of people who work with chemicals, lasers, X-rays, isotopic sources, toxic fuels, adhesives, and exotic metals. Complete medical data on the examined population are continuously updated for a broad medical master file. Statistical methods are employed to project progressive changes in the health status of these employees for possible clinical interventions. G.G.

N73-17069* Public Health Service, Washington, D.C.
PERSONAL BENEFITS OF A HEALTH EVALUATION AND ENHANCEMENT PROGRAM
Fred Heinzelmann and Donald C. Durbeck *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 52-79 refs (For availability see N73-17064 08-04)
CSCL 06E

A study was made of the benefits reported by participants in a health evaluation and enhancement program dealing with physical activity. Program benefits were identified and defined in regard to three major areas: program effects on work; program effects on health; and program effects on habits and behavior. A strong positive and consistent relationship was found between reported benefits in each of these areas and measures of improvement in cardiovascular functioning based on treadmill performance. Significant differences in these measures of improvement were also found between participants who reported program benefits and those persons who did not. These findings provide a meaningful profile of the pattern of benefits generated by this kind of health program. Author

N73-17070* National Aeronautics and Space Administration, Washington, D.C.
FACILITIES ENGINEERING IN NASA c34
Michael A. Pagluiso *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 80-82 (For availability see N73-17064 08-04)
CSCL 13H

An overview of NASA facilities is given outlining some of the more interesting and unique aspects of engineering and facilities associated with the space program. Outlined are some of the policies under which the Office of Facilities conducts its business. Included are environmental quality control measures. Author

N73-17071* Army Environmental Hygiene Agency, Edgewood Arsenal, Md. Laser-Microwave Div.
HAZARDS FROM HIGH INTENSITY LAMPS AND ARCS
David H. Sliney *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 83-95 refs (For availability see N73-17064 08-04)
CSCL 06R

The principal occupational health problem generally associated with high intensity arc lamps results from exposure of the eye and skin to ultraviolet radiation. Occasionally, the chorioretinal burns are of concern. The eye is generally more susceptible than the skin to injury from high intensity optical radiation sources whether ultraviolet, visible or infrared. Recent developments in technology have shown that some high intensity optical radiation sources which have output parameters greatly different from those encountered in the natural environment present a serious chorioretinal burn hazard. Author

N73-17072* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE VALUE OF CONTINUED FOLLOWUP IN A PREVENTIVE MEDICINE PROGRAM
Carlos Villafana and Jean Mockbee *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 96-119 (For availability see N73-17064 08-04)
CSCL 06E

Continued monitoring of hypertension and cholesterol levels in NASA employees by regularly scheduled medical examinations prevents an increase in employee disability and cardiovascular mortality rates. Adequate therapeutic control for younger hypertensive employees is demonstrated by records on mortality and heart diseases over a period of 28 months. It confirmed the importance of systolic blood pressure as diagnostic tool for the inherent risk factor. The prevalence of additional coronary risk factors among employees with hypercholesterolemia is considerably less than in employees with hypertension. G.G.

N73-17073* San Antonio State Tuberculosis Hospital, Tex.
LABORATORY ASPECTS OF BLOOD LIPIDS
Frank M. Townsend *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 120-130 refs (For availability see N73-17064 08-04)
CSCL 06E

Classification of blood hyperlipemias by electrophoresis or ultracentrifugation according to density fraction is described and therapeutic measures for humans with hyperlipoproteinemia are outlined. The statistically significant relationship between high serum cholesterol levels and incidence of coronary disease prescribes restricted caloric intake or physical exercise to burn excess calories as preventive measures. G.G.

N73-17074* Harvard School of Public Health, Boston, Mass. Dept. of Physiology.
PROGRAMMED MULTIPHASIC HEALTH TESTING
Philip I. Hershberg *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 131-143 refs (For availability see N73-17064 08-04)
(Grant NGR-22-007-203)
CSCL 06E

Multiphase health screening procedures are advocated for detection and prevention of disease at an early stage through risk factor analysis. The use of an automated medical history questionnaire together with scheduled physical examination data provides a scanning input for computer printout. This system makes it possible to process laboratory results from 1,000 to 2,000 patients for biochemical determinations on an economically feasible base. G.G.

N73-17075* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTROL OF NITROGEN DIOXIDE IN STACK EMISSION BY REACTION WITH AMMONIA c33
Allen J. Metzler and Edward F. Stevenson *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 144-171 refs (For availability see N73-17064 08-04)
CSCL 21B

The development of an acid base gas-phase reaction system which utilizes anhydrous ammonia as the reactant to remove nitrogen dioxide from hydrazine-nitrogen tetroxide rocket combustion exhaust is reported. This reaction reduced NO2 levels in exhaust emissions so that the resulting stack emission is completely white instead of the earlier observed typical reddish-brown coloration. Preliminary analyses indicate the importance of reaction time and ammonia concentration on removal efficiency and elimination of the health hazard to individuals with respiratory problems. G.G.

N73-17076* Trans World Airlines, Inc., Kansas City, Mo. Medical Service.
FLIGHT CREW HEALTH MAINTENANCE
Charles C. Gullett *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 172-177 (For availability see N73-17064 08-04)
CSCL 06E

The health maintenance program for commercial flight crew personnel includes diet, weight control, and exercise to prevent heart disease development and disability grounding. The very high correlation between hypertension and overweight in cardiovascular diseases significantly influences the prognosis for a coronary prone individual and results in a high rejection rate of active military pilots applying for civilian jobs. In addition to physical fitness the major items stressed in pilot selection are: emotional maturity, glucose tolerance, and family health history. G.G.

N73-17077* Boeing Co., Seattle, Wash.
OCCUPATIONAL MEDICAL TRENDS IN THE 70'S FROM INDUSTRIAL VIEW
Sherman M. Williamson *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 178-180 (For availability see N73-17064 08-04)
CSCL 06E

Industrial health measures to ensure worker productivity constitute physical examinations as well as environmental control systems. Considered are automatic record keeping facilities for case histories, preventive medical and mental counselling, development of safety standards, and health insurance and disability benefit plans. Cooperation of industry health programs with community health aspects is required to eliminate the loss of manpower capability through alcoholism or mental disease. G.G.

N73-17078*# National Aeronautics and Space Administration, Washington, D.C.
PROCEEDINGS OF THE ANNUAL CONFERENCE OF NASA CLINIC DIRECTORS, ENVIRONMENTAL HEALTH OFFICIALS AND MEDICAL PROGRAM ADVISORS
1971 274 p refs Conf. held at Charleston, S. C., 12-14 Oct. 1971
(NASA-TM-X-69074) Avail: NTIS HC $15.75 CSCL 06E

Data covering techniques and types of services provided to NASA employees in occupational medicine and environmental health are outlined. Specific summaries are given for coronary disease, chronic disease, and occupation induced disorders. Numerous other topics, procedures, and medical equipment are also discussed. For individual titles, see N73-17079 through N73-17097.

N73-17079* National Aeronautics and Space Administration, Washington, D.C.
THE MANAGEMENT OF NASA EMPLOYEE HEALTH PROBLEM; STATUS 1971
Louis B. Arnoldi *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 1-16 (For availability see N73-17078 08-04)
CSCL 06E

A system for assessing employee health problems is introduced. The automated billing system is based on an input format including cost of medical services by user and measures in dollars, that portion of resources spent on preventive techniques versus therapeutic techniques. The system is capable of printing long term medical histories of any employee. E.H.W.

N73-17080* National Aeronautics and Space Administration, Washington, D.C.
CORONARY RISK FACTOR SCORING AS A GUIDE FOR COUNSELING
Robert L. Fleck *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 17-28 (For availability see N73-17078 08-04)
CSCL 06E

A risk factor scoring system for early detection, possible prediction, and counseling to coronary heart disease patients is discussed. Scoring data include dynamic EKG, cholesterol levels, triglycerine content, total lipid level, total phospolipid levels, and electrophoretic patterns. Results indicate such a system is effective in identifying high risk subjects, but that the ability to predict

exceeds the ability to prevent heart disease or its complications. E.H.W.

N73-17081* Catholic Univ. of America, Washington, D.C.
THE MOTIVATING INFLUENCE OF RETEST AND REPEATED DIETARY COUNSELING ON CHOLESTEROL REDUCTION
Paul Taylor, John C. Townsend, Carlos Villafana, and Louis B. Arnoldi *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 29-49 refs (For availability see N73-17078 08-04)
CSCL 06E

An analysis was made of retest and followup counselling effects on the reduction of hypercholesterolemia levels in NASA employees. Criteria used to measure such control include motivation, age of patient, personality of patient, job stress, and physical exercise. E.H.W.

N73-17082* Pan American World Airways, Inc., Cocoa Beach, Fla.
STRESS STUDIES AT KENNEDY SPACE CENTER: A BACKWARD AND FORWARD LOOK
A. I. Decker *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 50-72 (For availability see N73-17078 08-04)
CSCL 06S

Possible relationships between occupational and other stresses on ischemic heart disease are explored. Three procedures were used: (1) double master 2-step test, (2) dynamic ECG technique using avionics equipment, and (3) submaximal stress testing with Marco bicycle ergometer. E.H.W.

N73-17083* Harvard Univ., Boston, Mass.
LONG TERM CLINICAL RELATIONSHIPS OF THE VENTRICULAR PREMATURE BEAT
Philip I. Hershberg, D. Desai (Lahey Clinic Foundation), and Sidney S. Alexander (Lahey Clinic Foundation) *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 73-85 refs (For availability see N73-17078 08-04)
CSCL 06E

A study of the relationship between ventricular premature beats, mortality, and acute myocardial infarction in a clinic population is reported. Statistical results are presented in tables. Author

N73-17084* Kettering Memorial Hospital, Dayton, Ohio.
THE CORONARY PATIENT IN INDUSTRY
Benjamin Schuster *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 86-99 (For availability see N73-17078 08-04)
CSCL 06E

The coronary patient, as he pertains to industry particularly NASA, is discussed. Concepts of precoronary care, acute attacks which may develop while on the job, and the return of the cardiac patient to work are covered. Major emphasis was on the prevention of sudden death due to coronary disease. Author

N73-17085* National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
INFRASOUND
F. G. Pierce *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 100-107 refs (For availability see N73-17078 08-04)
CSCL 06S

Infrasound, sound frequencies from 2 to 20 cpc, is defined and its effects on the human body are analyzed. Subjective symptoms of infrasound include fatigue, irritability, insomnia, headache, lack of ability to concentrate, and loss of equilibrium. No conclusive results were reported. E.H.W.

N73-17086* SysteMed Corp., Dayton, Ohio.
THE MANAGEMENT OF CHRONIC DISEASE: A STUDY OF EMPLOYEE MORBIDITY AND MORTALITY AT THE NASA, GODDARD SPACE FLIGHT CENTER, 1966 - 1971
Carlos Villafana and Jean Mockbee *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 108-134 (For availability see N73-17078 08-04)
CSCL 06E

Several approaches to studying chronic disease patterns in the employee population at Goddard Space Flight Center from 1966 to 1970 are presented. Attempts were made to summarize preliminary data for 1971 and relate this data to specific programs and events which may have had some causative influence. Investigative data for the study cover records of periodic and return to work examinations, injury and illness visit reports, mortality data, and health trends with and without external influences. E.H.W.

N73-17087* Brunswick Naval Air Station, Me.
AUTOMATION OF THE PROBLEM ORIENTED MEDICAL RECORD c05
D. W. Schall *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 135-144 (For availability see N73-17078 08-04)
CSCL 05B

An improved ambulatory care delivery system developed for the Navy is examined. The system is centered around the concepts of problem oriented medical records and expanded use of paramedical personnel. E.H.W.

N73-17088* National Aeronautics and Space Administration. Wallops Station, Wallops Island, Va.
A CASE OF NEAR FATAL AMMONIA GAS POISONING
Edward White *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 145-150 (For availability see N73-17078 08-04)
CSCL 06T

A report is given of the near fatal effects of anhydrous ammonia poisoning to a repairman working on a compression room cooling system. The repairman was exposed for approximately 5 minutes to an environment of nearly 100% ammonia gas. Descriptions are given of body burns, breathing problems, and eye burns suffered by the worker. E.H.W.

N73-17089* San Antonio State Tuberculosis Hospital, Tex.
SOME PITFALLS OF URINE ANALYSIS
Frank M. Townsend *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 151-161 refs (For availability see N73-17078 08-04)
CSCL 06E

Possible failures or erroneous findings during routine urine analysis are surveyed. Data cover tablet, tape, and stick type analysis techniques. E.H.W.

N73-17090* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
BACTERIAL IDENTIFICATION USING LIGHT SCATTERING MEASUREMENTS: A PRELIMINARY REPORT
Judd R. Wilkins *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 162-172 refs (For availability see N73-17078 08-04)
CSCL 06M

The light scattering properties of single bacterial cells were examined as a possible means of identification. Three species were studied with streptococcus faecalis exhibiting a unique pattern; the light-scattering traces for staphylococcus aureus and escherichia coli were quite similar although differences existed. Based on preliminary investigations, the light scattering approach appeared promising with additional research needed to include a wide variety of bacterial species, computer capability to handle and analyze data, and expansion of light scattering theory to include bacterial cells. Author

N73-17091* Public Health Service, Rockville, Md.
THE NASA-USPHS HEALTH EVALUATION AND ENHANCEMENT PROGRAM
D. C. Durbeck, F. Heinzelmann, R. T. Moxley, III, J. Schacther, G. H. Payne, D. D. Limoncelli, S. M. Fox, III, and Louis B. Arnoldi *In* NASA, Washington Proc. of the Ann. Conf. of

NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1972 p 173-195 refs (For availability see N73-17078 08-04)
CSCL 06E

An exercise program was initiated to assess the feasibility of an on the job health evaluation and enhancement program, as well as to identify the factors which influenced volunteering, adherence, and effectiveness of the program. The program was utilized by 237 of the 998 eligible Federal employees, with a mean attendance of 1.3 days per week. Those who volunteered perceived a need for increased physical activity, felt they had sufficient time to participate, and derived subjective as well as objective benefits. Significant improvements were found in heart rate response to the standard exercise test, body weight, skinfold measurements, and triglycerides. A consistent relationship was found between subjectively reported effects of the program on work, health habits, and behavior, and improvement in cardiovascular function, based on treadmill performance. Numerous personal and programmatic factors influencing volunteering and participation were identified. Author

N73-17092* National Health Service, Inc., New York.
IMPACT OF NASA STRESS LABORATORY PROGRAM ON US COLLEGES
S. P. DeLisser *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 196-203 (For availability see N73-17078 08-04)
CSCL 06S

A programmatic narrative of the effects of NASA stress lab program on physical education in U.S. schools and colleges is presented. Individual non-structured programs were set up where students participate during his or her free time. The program is also in accordance with the medical history of the student. Preliminary results indicate more student interest and participation in the program and that students are generally more physically fit than in previous structured programs. E.H.W.

N73-17093* National Aeronautics and Space Administration. Flight Research Center, Edwards, Calif.
AN OPERATING ENVIRONMENTAL HEALTH PROGRAM
Jose G. Lipana, Richard L. Masters (Lovelace Found. for Med. Educ. and Res.), and William R. Winter *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 204-223 (For availability see N73-17078 08-04)
CSCL 06E

Some concepts of an operational program for medical and environmental health are outlined. Medical services of this program are primarily concerned with emergency care, laboratory examinations, advice to private physicians with patient permission, medical monitoring activities, and suggestions for treatment or control of the malfunction. E.H.W.

N73-17094* Army Environmental Hygiene Agency, Edgewood Arsenal, Md.
NEW STANDARDS FOR ULTRAVIOLET RADIATION
David H. Sliney *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 224-240 refs (For availability see N73-17078 08-04)
CSCL 06R

Guidelines covering safe levels for exposure to ultraviolet radiation in an occupational environment are reported. The guidelines clarify the spectral radiant exposure doses and relative spectral effectiveness of ultraviolet radiation required to elicit adverse biologic effects. E.H.W.

N73-17095* National Aeronautics and Space Administration, Washington, D.C.
HAZARD PAY: AN EFFECTIVE ANTAGONIST c34
R. E. Alexander *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 241-248 (For availability see N73-17078 08-04)
CSCL 05C

Procedures for allocating hazardous pay to employees are outlined. According to the guidelines, only top level management can authorize hazardous tasks and decide if said task is indeed hazardous. The guidelines also state that hazardous jobs may be performed only if it is essential to finish a project and cannot be adequately safequarded. E.H.W.

N73-17096* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALLEGED MERCURY DISCHARGE BY THE LEWIS RESEARCH CENTER c13
Louis Rosenbluum *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 249-259 (For availability see N73-17078 08-04)
CSCL 06F

Water sample analysis, site visits, and effluent reports are examined in an attempt to identify the sources contributing to mercury pollution of the Great Lakes. Two sources were identified, Lewis Research Center and Dow Chemical of Canada. Tests were made during a period from April to September 1970. E.H.W.

N73-17097* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LEAD PENCILS
Leven B. Gray *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 260-264 (For availability see N73-17078 08-04)
CSCL 06T

A study, undertaken to determine the lead content of paint on various pencils in the Goddard supply system, is reported. The survey found that lead content varied from .04 mg per pencil for carmine colored pencils to approximately 43 mg per pencil for yellow colored pencils. Results also show that yellow pencils had higher lead content than other colors analyzed. More detailed results are given in tabular form. E.H.W.

N73-17098# Advisory Group for Aerospace Research and Development, Paris (France).
AEROMEDICAL ASPECTS OF VIBRATION AND NOISE
J. C. Guignard and P. F. King Nov. 1972 280 p refs (AGARDograph-151; AGARD-AG-151) Avail: NTIS HC $16.00

Effects of aerospace vibration and noise on man are considered. The special aeromedical problems of auditory perception and noise injuries in aircrew and ground support personnel are emphasized. For individual titles, see N73-17099 through N73-17101.

N73-17099 Wright State Univ., Dayton, Ohio. Dept. of Engineering.
VIBRATION
J. C. Guignard *In* AGARD Aeromed. Aspects of Vibration and Noise Nov. 1972 p 1-113 refs (For availability see N73-17098 08-04)

The nature of structure-borne vibration and its occurrence in aerospace operations are considered by mechanical and biological actions upon man, and by the criteria and principles of protecting man from its adverse effects. Author

N73-17100 Wright State Univ., Dayton, Ohio.
NOISE
J. C. Guignard *In* AGARD Aeromed. Aspects of Vibration and Noise Nov. 1972 p 114-203 refs (For availability see N73-17098 08-04)

Nature, measurement and occurrence of airborne noise in aerospace operations are considered by the biological effects on man. General criteria and principles of the protection of man from the adverse effects of noise on human well being and working efficiency are outlined. Author

N73-17101 Royal Air Force Central Medical Establishment, London (England).
HEARING CONSERVATION IN AIRCREW AND GROUND SUPPORT PERSONNEL
P. F. King *In* AGARD Aeromed. Aspects of Vibration and Noise Nov. 1972 p 204-257 refs (For availability see N73-17098 08-04)

The effects of noise on human hearing, both temporary and permanently, are reviewed and related to the working situations of members of aircrews and ground support personnel. Measures

to be taken to prevent noise damage in the peripheral parts of the human hearing mechanism and to conserve hearing in personnel exposed to hazardous noise levels are outlined.
Author

N73-17102*# American Inst. for Research, Washington, D.C.
DEVELOPMENT OF A STANDARDIZED BATTERY OF PERFORMANCE TESTS FOR THE ASSESSMENT OF NOISE STRESS EFFECTS
George C. Theologus, George R. Wheaton, Angelo Mirabella, and Rae E. Brahlek NASA Jan. 1973 125 p refs
(Contract NAS1-9854)
(NASA-CR-2149) Avail: NTIS HC $3.00 CSCL 06S

A set of 36 relatively independent categories of human performance were identified. These categories encompass human performance in the cognitive, perceptual, and psychomotor areas, and include diagnostic measures and sensitive performance metrics. Then a prototype standardized test battery was constructed, and research was conducted to obtain information on the sensitivity of the tests to stress, the sensitivity of selected categories of performance degradation, the time course of stress effects on each of the selected tests, and the learning curves associated with each test. A research project utilizing a three factor partially repeated analysis of covariance design was conducted in which 60 male subjects were exposed to variations in noise level and quality during performance testing. Effects of randomly intermittent noise on performance of the reaction time tests were observed, but most of the other performance tests showed consistent stability. The results of 14 analyses of covariance of the data taken from the performance of the 60 subjects on the prototype standardized test battery provided information which will enable the final development and test of a standardized test battery and the associated development of differential sensitivity metrics and diagnostic classificatory system.
Author

N73-17103*# Stanford Research Inst., Menlo Park, Calif.
THE PROBABILISTIC STRUCTURE OF PLANETARY CONTAMINATION MODELS
J. Michael Harrison and Warner D. North 30 Jan. 1973 33 p refs Presented at Semian. NASA Spacecraft Sterilization Technol. Seminar, New Orleans
(Contract NASw-2451; SRI Proj. 2274)
(NASA-CR-130558; Proj-Memo-1) Avail: NTIS HC $3.75 CSCL 06M

The analytical basis for planetary quarantine standards and procedures is presented. The heirarchy of planetary quarantine decisions is explained and emphasis is placed on the determination of mission specifications to include sterilization. The influence of the Sagan-Coleman probabilistic model of planetary contamination on current standards and procedures is analyzed. A classical problem in probability theory which provides a close conceptual parallel to the type of dependence present in the contamination problem is presented.
Author

N73-17104# Joint Publications Research Service, Arlington, Va.
EMOTIONAL STRESS DURING SPACEFLIGHT
L. Khachaturyants and L. Grimak 23 Jan. 1973 9 p Transl. into ENGLISH from Aviats. i Kosmonavt. (Moscow), no. 11, 1972 p 33-34
(JPRS-58039) Avail: NTIS HC $3.00

An examination of the emotional stress of cosmonauts during spaceflight is reported. Specific examples are cited including crews of the Voskhod-2 and Soyuz-4 and Soyuz-5 space ships.
Author

N73-17105*# National Aeronautics and Space Administration, Washington, D.C.
PROBLEM OF ACCELERATION IN AVIATION MEDICINE. PART 3: FUNCTIONAL CHANGES IN THE NERVOUS SYSTEM DURING G-LOADS AND WEIGHTLESSNESS
G. L. Komendantov Feb. 1973 59 p refs Transl. into ENGLISH of the publ. "Problema Uskoreniy v Aviatsionnoy Meditsine. Chast 3: Izmeneniya Funktsiy Nervnoy sistemy pri Peregruzkakh i Nevesomosti" Moscow, USSR Min. of Health, 1971 p 3-44
(NASA-TT-F-733) Avail: NTIS HC $3.00 CSCL 06S

G-loads and weightlessness subject the human body to unusual stress during flights in aircraft and space vehicles. Equilibrium is difficult to maintain, and normal conditioned reflex activity is distorted by G-loads directed from the head to the pelvis and from the chest to the back. Numerous statistical data from a broad spectrum of Soviet sources constitute a survey of these specific problems.
Author

N73-17106# Advisory Group for Aerospace Research and Development, Paris (France).
SPECIAL ASPECTS OF AVIATION OCCUPATIONAL MEDICINE. CARDIOVASCULAR AND NERVOUS SYSTEM EFFECTS OF BROMOTRIFLUOROMETHANE
K. C. Back (AMRL) and E. W. VanStee (AMRL) Nov. 1972 20 p refs
(AGARD-R-599) Avail: NTIS HC $3.00

The effects of three fluorocarbons of the haloalkane group, principally with bromotrifluoromethane, which have applications as effective fire extinguishing agents are studied. Animal experiments, performed to explore the mechanisms of the pharmacodynamic properties and to assess the toxic hazards associated with their use, are described. All three compounds have biological side effects and the report provides preliminary information, derived from animal experiments, on acceptable working concentrations for human exposure.
Author

N73-17107*# Aerojet Medical and Biological Systems, El Monte, Calif.
MICROBIAL ECOLOGY MEASUREMENT SYSTEM Final Report, Oct. 1970 - Jul. 1972
Jul. 1972 128 p
(Contract NAS9-11371)
(NASA-CR-128731) Avail: NTIS HC $8.50 CSCL 06M

The sensitivity and potential rapidity of the PIA test that was demonstrated during the feasibility study warranted continuing the effort to examine the possibility of adapting this test to an automated procedure that could be used during manned missions. The effort during this program has optimized the test conditions for two important respiratory pathogens, influenza virus and Mycoplasma pneumoniae, developed a laboratory model automated detection system, and investigated a group antigen concept for virus detection. Preliminary tests on the handling of oropharyngeal clinical samples for PIA testing were performed using the adenovirus system. The results obtained indicated that the PIA signal is reduced in positive samples and is increased in negative samples. Treatment with cysteine appeared to reduce nonspecific agglutination in negative samples but did not maintain the signal in positive samples.
Author

N73-17108# Research Inst. of National Defence, Stockholm (Sweden).
CORRELATION BETWEEN MAN AND MOUSE IN RESPECT OF PHYSICAL ACTIVITY AND OXYGEN CONSUMPTION FOA Reports, Volume 6, No. 11
Carl-Olov Criborn Oct. 1972 7 p refs
(FOA-1-B-1233-A5; ISBN-91-7056-018-8) Avail: NTIS HC $3.00

In an attempt to discover the extent to which the results of experiments with mice are comparable to corresponding results found in studies of man, a study was made of correlations between mouse and man primarily in respect of physical activity and oxygen consumption. Treadwheels or treadmills are used to define and measure activity in the form of running speed, running time, distance run, etc. The basal metabolism, measured in oxygen consumption per unit of body weight, differs greatly between man and mouse, whereas the relative change in oxygen consumption on a change in activity is roughly the same. The difference in basal metabolism, however, may affect the sensitivity to variations in room temperature differently in man and in mouse, and may give rise to discrepancies in respect of the duration of symptoms.
Author

N73-17109*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
MICROBIOLOGICAL SAMPLING OF SPACECRAFT CABLING, ANTENNAS, SOLAR PANELS AND THERMAL BLANKETS
R. C. Koukol 15 Feb. 1973 20 p
(Contract NAS7-100)
(NASA-CR-130383; JPL-900-602) Avail: NTIS HC $3.00 CSCL

06M

Sampling procedures and techniques described resulted from various flight project microbiological monitoring programs of unmanned planetary spacecraft. Concurrent with development of these procedures, compatibility evaluations were effected with the cognizant spacecraft subsystem engineers to assure that degradation factors would not be induced during the monitoring program. Of significance were those areas of the spacecraft configuration for which special handling precautions and/or nonstandard sample gathering techniques were evolved. These spacecraft component areas were: cabling, high gain antenna, solar panels, and thermal blankets. The compilation of these techniques provides a historical reference for both the qualification and quantification of sampling parameters as applied to the Mariner Spacecraft of the late 1960's and early 1970's. Author

N73-17110*# Kanner (Leo) Associates, Redwood City, Calif.
PHYSIOLOGICAL PROBLEMS OF PROLONGED WEIGHTLESSNESS
N. N. Gurovskiy and A. A. Kiselev Washington NASA Feb. 1973 16 p Transl. into ENGLISH from Astronaut. Acta (Austria), v. 17, 1972 p 79-88 (Russian language report)
(Contract NASw-2481)
(NASA-TT-F-14672) Avail: NTIS HC $3.00 CSCL 06S

Two dogs were exposed to weightlessness for about 22 days aboard the Soviet Cosmos 110 artificial satellite. Changes in cardiodynamics characterized as the functional hyperdynamia cordis syndrome were revealed. The functions of the digestive, motor, coagulative and other systems of the animals' organisms were investigated. Among the significant changes discovered were: a 30 percent loss in body weight; disturbances of ion equilibrium and related water loss; disturbed enzyme forming function of the large intestine resulting in a sharp increase in the content of the intestinal enzymes enterokinase and alkaline phosphotase; 10-11 percent reduction in the mineral concentration in bone tissue; and descrease in lysozyme activity. The data indicate that space missions of relatively long duration (over 20 days) produce qualitatively new and more pronounced changes in the animal organism as compared to earlier flights of shorter duration. Author

N73-17111*# North Dakota State Univ., Fargo. Dept. of Polymers and Coatings.
QUANTITATION OF BURIED CONTAMINATION BY USE OF SOLVENTS Semiannual Report, 1 Jul. - 31 Dec. 1972
S. Peter Pappas, Paul Hsiao, and Loren W. Hill 31 Dec. 1972 13 p refs
(Grant NGR-35-001-012)
(NASA-CR-130720) Avail: NTIS HC $3.00 CSCL 06M

An investigation was made to determine (1) sporicidal properties of amine solvents that solubilize silicon resins, (2) recovery properties of a silicon potting compound (RTV 41) used in spacecraft, and (3) viability of spores during chemical curing of the potting compound. Results show that: (1) spores do remain viable during RTV 41 silicon potting chemical curing, and (2) spore recovery from cured silicon potting compound RTV 41 is very high when silicon rubber is dissolved in butylamine and series dilution with benzene prior to plate curing. E.H.W.

N73-17112*# Ohio State Univ. Research Foundation, Columbus. Dept. of Anatomy.
EFFECTS OF WEIGHTLESSNESS ON THE DEVELOPMENT OF THE VESTIBULAR APPARATUS AND OCULAR NYSTAGMUS IN THE RAT Annual Report, 1 Oct. 1971 - 30 Sep. 1972
David L. Clark 18 Dec. 1972 54 p refs
(Contract NAS2-6634; RF Proj. 3329-A1)
(NASA-CR-114569; Rept-4) Avail: NTIS HC $4.75 CSCL 06C

The chronic 2g centrifuge was constructed for testing weightlessness effects on development of vestibular apparatus and ocular nystagmus in the rat. Both the stationary and rotating rail tests were performed. A physiological review is presented on vestibular apparatus, along with a system analysis. Time constants and input threshold level of the system are also considered. J.A.M.

N73-17113*# St. Louis Univ., Mo. Dept. of Physiology.
OBJECTIVE EVALUATION OF CUTANEOUS THERMAL SENSIVITY
W. VanBeaumont Oct. 1972 62 p refs
(Grant NGR-26-006-039)
(NASA-CR-114564) Avail: NTIS HC $5.25 CSCL 06P

The possibility of obtaining reliable and objective quantitative responses was investigated under conditions where only temperature changes in localized cutaneous areas evoked measurable changes in remote sudomotor activity. Both male and female subjects were studied to evaluate sex difference in thermal sensitivity. The results discussed include: sweat rate responses to contralateral cooling, comparison of sweat rate responses between men and women to contralateral cooling, influence of the menstrual cycle on the sweat rate responses to contralateral cooling, comparison of threshold of sweating responses between men and women, and correlation of latency to threshold for whole body sweating. It is concluded that the quantitative aspects of the reflex response is affected by both the density and activation of receptors as well as the rate of heat loss; men responded 8-10% more frequently than women to thermode cooling, the magnitude of responses being greater for men; and women responded 7-9% more frequently to thermode cooling on day 1 of menstruation, as compared to day 15. F.O.S.

N73-17114*# Battelle-Northwest, Richland, Wash.
MEASUREMENT OF RADIATION EXPOSURE OF ASTRONAUTS BY RADIOCHEMICAL TECHNIQUES Quarterly Research Report, 3 Jan. - 2 Apr. 1972
R. L Brodzinski 15 Apr. 1972 29 p refs Sponsored by NASA and AEC
(NASA-CR-130538; BNWL-1183-11) Avail: NTIS HC $3.50 CSCL 06S

Only two of the fecal specimens collected inflight during the Apollo 15 mission were returned for analysis. Difficulty in obtaining reasonably accurate radiation dose estimates based on the cosmogenic radionuclide content of the specimens was encountered due to the limited sampling. The concentrations of Na-22, K-40, Cr-51, Fe-59, and Cs-137 are reported. The concentrations of 24 major, minor, and trace elements in these two specimens were determined. Most concentrations are typical of those observed previously. Major exceptions are extremely low values for selenium and extraordinarily high values for rare earth elements. The net Po-210 activities in the Apollo 11 and 12 Solar Wind Composition foils and in the Apollo 8 and 12 spacecraft reflective coatings due to lunar exposure have been determined. Equilibrium concentrations of 0.082 + or - 0.012 disintegrations /sq cm sec of Rn-222 in the lunar atmosphere and 0.0238 + or - 0.0035 disintegrations /sq cm sec of Po-210 on the lunar surface have been calculated for Oceanus Procellarum. Author

N73-17115# Texas Technological Univ., Lubbock. Center of Biotechnology and Human Performance.
INDIVIDUAL DIFFERENCES AS A FUNCTION OF FOUR CHOICE INFORMATIONAL LOAD AND S-R COMPATIBILITY
Lewis E. Waldeisen, Jerry M. Owens, and Charles G. Halcomb Oct. 1972 21 p refs
(Contract DAAD05-69-C-0102; DA Proj. 1T0-14501-B-81A; Proj. Themis-603)
(AD-752073) Avail: NTIS CSCL 05/10

A four choice reaction-time task using color and symbol dimensions was varied in terms of type of stimulus presentation and S-R compatibility. Six groups of 20 Ss each performed six different task versions. Responding with hands only in four groups proved significantly easier than hand-foot responding in two other groups. The group receiving a singular dimension of colors performed significantly better than a group receiving only symbols. Both of these groups demonstrated greater efficiency than two groups required to filter noise or irrelevant dimensions. Distributions of scores increased considerably about group means with increasing informational load and decreasing S-R compatibility. The utility of the choice reaction task for discriminating individual skill potentials in various information-handling situations was affirmed. Author (GRA)

N73-17116# Human Engineering Labs., Aberdeen Proving Ground, Md.
PUPILLOMETRY USING AN ADVANCED-DESIGN OCULOMETER
Robert J. Hall Nov. 1972 18 p refs Presented at the 80th Ann. Conv. of the Am. Psychological Assoc., Honolulu, Hawaii, 2-8 Sep. 1972
(AD-752121; HEL-TM-25-72) Avail: NTIS CSCL 05/10

A number of available eye monitoring techniques are briefly contrasted to show the advantages and limitations of each. In addition a recently developed oculometer is described which is unique in that it provides: (1) a technique for tracking and observing the eye which does not interfere with the subject's normal viewing behavior, (2) data reduction capacity for handling large volumes of data on an on-line basis enabling immediate feedback to the subject and (3) measurement of a wide spectra of visual responses which include basic measures such as voluntary eye movement, blinking, changes in pupil size and derived measures such as variability of fixation times and scan patterns. Author (GRA)

05 BIOTECHNOLOGY

Includes life support systems, human engineering; protective clothing and equipment; crew training and evaluation, and piloting. For related information see also: 04 Biosciences.

N73-17117*# Martin Marietta Corp., Denver, Colo.
CONCEPTUAL DESIGN STUDY FOR A TELEOPERATOR VISUAL SYSTEM, PHASE 1 Final Report
D. Adams, C. Grant, C. Johnson, R. Meirick, C. Polhemus, A. Ray, D. Rittenhouse, and R. Skidmore Dec. 1972 175 p refs (Contract NAS8-29024)
(NASA-CR-124059; MCR-72-276) Avail: NTIS HC $10.75 CSCL 05H

Results are reported for work performed during the first phase of the conceptual design study for a teleoperator visual system. This phase consists of four tasks: General requirements, concept development, subsystem requirements and analysis, and concept evaluation. Author

N73-17118*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
PILOT PERFORMANCE DURING A SIMULATED STANDARD INSTRUMENT PROCEDURE TURN WITH AND WITHOUT A PREDICTOR DISPLAY
John G. Kreifeldt and Thomas Wempe Jan. 1973 34 p refs Prepared in cooperation with Tufts Univ., Medford, Mass.
(NASA-TM-X-62201) Avail: NTIS HC $3.75 CSCL 05E

A simulator study was conducted to measure the effectiveness of predictor information incorporated into a CRT display of a computer simulated aircraft's horizontal and vertical situation. Professional pilots served as subjects for the task of executing a standard instrument procedure turn at constant altitude in constant crosswinds with and without their predicted ground track displayed. The results showed that the display with the predicted ground track was markedly and significantly superior to the display without this information and that the subjects were generally satisfied with this type of information. Mean rms lateral path error was independent of the crosswind velocity with the predictor information, and increased without it and with increasing wind velocity. Rms stick activity decreased with the predictor display which also uncoupled aileron and elevator activity. Author

N73-17119# Civil Aeromedical Inst., Oklahoma City, Okla.
GPSS/360 COMPUTER MODELS TO SIMULATE AIRCRAFT PASSENGER EMERGENCY EVACUATION
Earl D. Folk, J. D. Garner, E. Allen Cook, and Jimmy L. Broadhurst (IBM, Oklahoma City) Sep. 1972 30 p refs
(FAA-AM-72-30) Avail: NTIS HC $3.50

Live tests of emergency evacuation of transport aircraft are simulated by computer models based on statistics from measured components of the escape path. The models utilize a computer programming language to represent various features of the escape process: passenger mix, seating and exit configuration, door-opening delay, time on the escape slide, and slide capacity. Two particular configurations of aircraft have been simulated: the Boeing 720 124-Passenger Model and a 234-Passenger Model. On the former the total time for all passengers to get out averaged 89.23 seconds, with a standard deviation of 6.38 seconds for 20 randomized runs. On the latter the corresponding average and standard deviations were 74.09 and 2.29 seconds, respectively. Both models indicated under-utilization of the aft exit. Author

N73-17120*# Acurex Corp., Mountain View, Calif.
HIGH PRESSURE SPACE SUIT GLOVE Final Report
William Elkins Jan. 1973 30 p
(Contract NAS2-7008)
(NASA-CR-114535) Avail: NTIS HC $3.50 CSCL 06Ω

The High Pressure Space Suit Glove Program yielded one prototype glove assembly with an operating pressure of 8.0 psi. The following developments are reported: (1) A new layup technique for incorporation of the mini-convolute systems; (2) modification in the mini-convolute construction to assure cycle life at 8.0 psi in excess of 100,000 cycles; (3) the development of a unique non-orthogonal low torque wrist joint; (4) the development of a low torque single axis joint for use in the thumb and finger first metacarpal joints; and (5) a number of approaches to 1st metacarpal joints were fabricated and tested to establish the joint technqiues. Author

N73-17121# Joint Publications Research Service, Arlington, Va.
PROBLEMS OF MAN'S INTERACTION WITH HIS NATURAL ENVIRONMENT
Ye. K. Fedorov and I. B. Novik 31 Jan. 1973 18 p refs Transl. into ENGLISH from Vopr. Filosofii (Moscow), no. 12 p 46-58
(JPRS-58113) Avail: NTIS HC $3.00

A survey of published discussions concerning problems of environmental pollution and depletion of natural resources is reported. It is concluded that in the process of optimization of interaction with nature there are fundamental advantages in a social system based on collective ownership. Author

N73-17122*# National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
AN INVESTIGATION OF A STERILE ACCESS TECHNIQUE FOR THE REPAIR AND ADJUSTMENT OF STERILE SPACECRAFT
Franklin H. Farmer, Harry V. Fuller, and Richard M. Hueschen Washington Feb. 1973 57 p refs
(NASA-TN-D-7147; L-8538) Avail: NTIS HC $3.00 CSCL 06M

A description is presented of a unique system for the sterilization and sterile repair of spacecraft and the results of a test program designed to assess the biological integrity and engineering reliability of the system. This trailer-mounted system, designated the model assembly sterilizer for testing (MAST), is capable of the dry-heat sterilization of spacecraft and/or components less than 2.3 meters in diameter at temperatures up to 433 K and the steam sterilization of components less than 0.724 meter in diameter. Sterile access to spacecraft is provided by two tunnel suits, called the bioisolator suit systems (BISS), which are contiguous with the walls of the sterilization chambers. The test program was designed primarily to verify the biological and engineering reliability of the MAST system by processing simulated space hardware. Each test cycle simulated the initial sterilization of a spacecraft, sterile repair of a failed component, removal of the spacecraft from the MAST for mating with the bus, and a sterile recycle repair. Author

N73-17123*# BioTechnology, Inc., Falls Church, Va.
HABITABILITY ISSUES IN LONG DURATION UNDERSEA AND SPACE MISSIONS Final Report
James F. Parker, Jr. and Martin G. Every Jul. 1972 57 p refs Sponsored in part by NASA
(Contract N00014-71-C-0397; NR Proj. 196-113)
(NASA-CR-130537; AD-747690) Avail: NTIS HC $5.00 CSCL 05/5

The report reviews a number of studies in the area of

habitability. Emphasis was placed on extracting from these studies that information most relevant to any long-term mission in confinement. It is concluded that, whereas the basic laws of habitability are known, there is much yet to be learned concerning development of social structures in small groups in relative isolation, planning for necessary hygiene needs, development of proper work spaces, and construction of internal and external communications systems. With respect to testing for habitability and the documentation of habitability principles, the space program was found to be considerably more advanced than was the program for undersea missions. Author (GRA)

N73-17124# Naval Aerospace Medical Research Lab., Pensacola, Fla.
EMPIRICAL REDUCTION IN POTENTIAL USER POPULATION AS THE RESULT OF IMPOSED MULTIVARIATE ANTHROPOMETRIC LIMITS Medical Research Progress Report
William F. Moroney and Margaret J. Smith 21 Sep. 1972 17 p refs
(AD-752032; NAMRL-1164; PR-1) Avail: NTIS CSCL 05/5

Data describing thirteen, cockpit related, anthropometric features of 1547 naval aviator personnel were examined. Two analyses were performed on these data. In the first analysis individuals not included within the 5th percentile to 95th percentile critical limits on any of the 13 features cited above were eliminated. After all 13 eliminations had been completed, 814 (52.6%) of the original 1547 naval aviator personnel had been excluded. In the second analysis, the critical limits were established at the 3rd and 98th percentiles, and 499 (32.2%) of the personnel were excluded. Thus, where one might have expected only 10 per cent of the population to have been excluded, 52.6 per cent were excluded, and where only 5 per cent theoretically might have been excluded, 32.2 per cent were excluded. This seeming discrepancy may be attributed to the intercorrelations existing between the 13 variables. The importance of considering the relationship between anthropometric features in determining anthropometric compatibility is discussed. The preparation of bivariate data, which are not variable specific but which could be used when the correlation between anthropometric features is known, is proposed. Author (GRA)

N73-17125# Naval Postgraduate School, Monterey, Calif.
THE USE OF A LINEAR RATING SCALE IN SELECTING A SUBCRITICAL TRACKING TASK PARAMETER
Ronald A. Hess Sep. 1972 29 p refs
(AD-752036; NPS-57HE72091A) Avail: NTIS CSCL 05/10

The results of a brief experimental study are presented in which subjective operator opinion, expressed on a linear, nonadjectival rating scale, was used in selecting a subcritical tracking task parameter. Author (GRA)

N73-17126# Environmental Health Lab., McClellan AFB, Calif.
THE INDUSTRIAL HYGIENE SURVEY Final Report
Ronald D. Burnett May 1972 42 p
(EHL Proj. OBC-209)
(AD-751897; EHL-M-72M-11) Avail: NTIS CSCL 06/9

The paper describes the complexities involved in conducting a meaningful industrial hygiene survey and is illustrated with numerous photographs of environmental evaluations being accomplished at a variety of typical Air Force industrial operations. The paper was presented at the USAF Occupational Safety and Health Act Conference held at the Air Force Inspection and Safety Center, Norton AFB, California on 18-20 Apr. 72 to familiarize safety personnel with the field of industrial hygiene. Author (GRA)

N73-17127# American Cyanamid Co., Bound Brook, N.J. Organic Chemicals Div.
PLASTIC MATERIALS FOR EYE PROTECTION FROM LASERS Technical Report, 3 May 1971 - 15 Jul. 1972
Allan E. Sherr, William F. Cordes, III, and Robert J. Tucker Oct. 1972 101 p refs
(Contract F41609-71-C-0019; AF Proj. 7784)
(AD-752594) Avail: NTIS CSCL 06/17

Plastic goggles were produced which offer protection against several lasers. The goggles had a minimum optical density of 3 at 300-400, 840, 1,060, 780-1,760 and 2,755 to 14,000 nm. Cast plastic sheet was prepared which had similar protective capabilities. Over 300 organic compounds were evaluated and/or synthesized as possible near infrared absorbing compounds. Several of these structural systems offer promise for laser protection. The compounds were evaluated in a variety of plastics including cellulose propionate, polymethyl methacrylate, polycarbonate, polyethylene terephthalate, and polyvinyl chloride. The propionate and methacrylate were the polymers of choice for most of the work. Cadmium stannate was investigated as an absorber and was shown to have some interesting spectral properties. A discussion is presented on the correlation between structure and spectral properties of several of the compounds studied. Author (GRA)

N73-17060* National Aeronautics and Space Administration. Electronics Research Center, Cambridge, Mass.
PRELIMINARY REPORT ON USE OF LAHEY CLINIC AUTOMATED HISTORY IN AN INDUSTRIAL COMPLEX
B. O. Leonardson *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 121-123 (For availability see N73-17048 08-04)
CSCL 05B

N73-17063* Massachusetts Inst. of Tech., Cambridge.
LABORATORY HOOD DESIGN
Richard I. Chamberlin *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1969 p 157-165 (For availability see N73-17048 08-04)
CSCL 06Q

N73-17087* Brunswick Naval Air Station, Me.
AUTOMATION OF THE PROBLEM ORIENTED MEDICAL RECORD
D. W. Schall *In* NASA, Washington Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 135-144 (For availability see N73-17078 08-04)
CSCL 05B

N73-17010 Royal Aircraft Establishment, Farnborough (England). Human Engineering Div.
PILOT WORKLOAD: A CONCEPTUAL MODEL
R. G. Thorne *In* AGARD Stability and Control Nov. 1972 6 p (For availability see N73-16989 08-02)

06 CHEMISTRY

Includes chemical analysis and identification (e.g. spectroscopy). For applications see: 17 Materials, Metallic; 18 Materials, Nonmetallic; and 27 Propellants.

N73-17128 Michigan Univ., Ann Arbor.
SPECTROSCOPIC DETECTION OF HYDROGEN FLUORIDE TRACER IN GASEOUS FLOW SYSTEMS Ph.D. Thesis
Philip Charles Malte 1971 244 p
Avail: Univ. Microfilms Order No. 72-14934

Present experimentation results from the continued desire of employing hydrogen fluoride as a passive tracer gas. In conjunction with infrared spectroscopic detection, the tracer is utilized to study turbulent mixing phenomena in both inert and combusting flows. Typically three molar percent of monomeric hydrogen fluoride, HF, is injected into a selected gas stream. Downstream in a resulting free, turbulently mixing, coaxial jet system - either inert of combusting - tracer concentrations are determined by spectroscopic observation of the R-branch of the fundamental band of the HF spectrum. Transverse optical scans of the gas jet are made and path integrated absorptances at the peak of selected isolated HF spectral lines measured. These data are numerically Abel inverted, thereby yielding radial distributions of tracer concentration. Dissert. Abstr.

N73-17129# National Bureau of Standards, Washington, D.C. Inst. for Materials Research.
THE MECHANISMS OF PYROLYSIS, OXIDATION, AND BURNING OF ORGANIC MATERIALS

Leo A. Wall, ed. Jun. 1972 192 p refs Proc. of 4th Mater. Res. Symp., Gaithersburg, Md., 26-29 Oct. 1970
(NBS-SP-357; LC-76-181873) Avail: SOD HC $3.25 as C 13.10

The current status of kinetic studies on the reactions of organic materials in both gas and condensed phases is reviewed. The topics covered include: pyrolysis of hydrocarbons, pyrolysis of polymers, oxidation of polymers, oxidation of organic compounds, and burning of polymers. For individual titles, see N73-17130 through N73-17148.

N73-17130 Johns Hopkins Univ., Baltimore, Md. Dept. of Chemistry.

THE GENESIS OF FREE RADICAL CHEMISTRY

Francis Owen Rice *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 1-6 refs (For availability see N73-17129 08-06)

An overview is presented of theories in the field of chemistry which eventually led to the acceptance, in the early 20th Century, of the existence of free radicals and of their importance in the mechanism of chemical transformations. Theories that developed thereafter and which confirmed this belief are also reviewed. Emphasis is placed on the Rice-Herzfeld theory which showed that it was possible, with free radicals, to explain quantitatively the mechanism of the thermal decomposition of organic compounds. D.L.G.

N73-17131 Naval Weapons Center, China Lake, Calif. Research Dept.

PYROLYSIS OF ORGANIC COMPOUNDS IN THE GAS PHASE

Alvin S. Gordon and R. H. Knipe *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 7-16 refs (For availability see N73-17129 08-06)

A critical review of the pyrolysis of organic compounds is made. The review is divided into hydrocarbons, halides, and oxy compounds. It is shown that most hydrocarbon reactions have an important unimolecular component, either the initial step in the case of chain reactions (e.g., saturated hydrocarbon decomposition) or a one step reaction which may involve a transient biradical structure. It is also shown that for halocarbon pyrolysis there are two reaction paths, one involving an unimolecular rupture of the carbon-halogen bond and the other an unimolecular elimination of the hydrogen halide molecule via a polarized activated complex. The preferred path is determined by the self-quenching efficiency of the radical path. If highly efficient, the molecular elimination path will dominate and vise versa. In some systems, the two paths are competitive. Oxy hydrocarbons such as acids and esters pyrolyze via the polarized complex molecular elimination path. Ethers appear to pyrolyze via a free radical chain mechanism while ethylene oxide is initiated by a unimolecular rearrangement to acetaldehyde with excess energy. Author

N73-17132 Ottawa Univ. (Ontario). Dept. of Chemistry.

PYROLYSIS OF HYDROCARBONS

Margaret H. Back *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 17-31 refs (For availability see N73-17129 08-06)

Some current problems arising from studies of the pyrolysis of hydrocarbons are discussed and two stages of these studies are distinguished. The first stage concerns the description of the mechanism of the pyrolysis in terms of a series of elementary reactions. The types of reactions occurring during the pyrolysis of olefins are discussed from this point of view and the effects of temperature and pressure on these elementary reactions are shown to produce predictable changes in the over-all pyrolysis. Some problems in the mechanism for the pyrolysis of acetylene are discussed and a mechanism proposed which relates the reactions occurring in both the high and low temperature regions. The second stage in pyrolysis studies is attained when the mechanism of the reaction may be satisfactorily described in detail and experiments may then be designed to measure the rate constants of the elementary processes. Several studies on the paraffins have attained this goal and the results are examined for consistency with related measurements. Author

N73-17133 Birmingham Univ. (England). Dept. of Chemistry.

FACTORS INVOLVED IN THE DEGRADATION OF POLYMERS IN MELTS

C. R. Patrick *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 33-45 refs (For availability see N73-17129 08-06)

Relationships between the kinetics of elementary reactions in gas and liquid phases are reviewed. On the basis of thermodynamic arguments it is concluded that Arrhenius parameters for bimolecular reactions in the two phases should differ, to a small but significant extent, greater than usually accepted, while those for unimolecular processes, commonly should not. Diffusion may determine the rates of some reactions in liquids particularly of reactions between radicals. Evidence on the mobilities of large and small molecules, models for radicals, in molten polymers, is summarized. Expressions for diffusion controlled reactions are compared, and applied to reactions in molten polymers. Complicating effects in the size dependence of the rates of diffusion controlled reactions between macroradicals are surveyed. Other complicating effects, notably of geminate reactions between radicals, are discussed. A case is made for comparing more extensively the kinetics of thermal degradation of gaseous paraffins, and of molten paraffins and polyethylenes. Author

N73-17134 National Bureau of Standards, Washington, D.C. Inst. for Materials Research.

PYROLYSIS OF POLYMERS

Leo A. Wall *In its* The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 47-60 refs (For availability see N73-17129 08-06)

It is shown that polymers can be divided into three groups according to the characteristics of their decomposition process. The three groups include those that decompose by net main chain scission, by stripping of the main chain, and by crosslinking of the main chain followed by some production of volatiles. Present knowledge concerning the pyrolysis mechanisms of these groups are reviewed. D.L.G.

N73-17135 Aberdeen Univ. (Scotland).

PATTERNS AND PROBLEMS IN THE PYROLYSIS BEHAVIOUR OF SYNTHETIC ADDITION POLYMERS

Gordon G. Cameron *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 61-72 refs (For availability see N73-17129 08-06)

The types of pyrolytic decomposition reactions undergone by synthetic addition polymers are outlined. Particular attention is given to two classes of polymer; those which undergo unzipping to monomer and those which fragment randomly along the backbone to yield low polymer. Free radical transfer reactions, usually involving tertiary hydrogen atoms, can play an important part in these degradation reactions. The thermal stability of addition polymers is not always predictable from known reactions of small molecules. This is often due to the presence of labile irregularities which are chemically incorporated in the macromolecules and which can initiate thermal decomposition. Also, since polymers are susceptible to chain reactions and neighboring group effects, these abnormalities can affect the stability of a large proportion of the sample. The effects on pyrolysis of abnormalities such as unsaturation, chain branches, head-to-head links and oxidation products are discussed. Author

N73-17136 Academy of Sciences (USSR), Moscow. Inst. of Chemical Physics.

ON CERTAIN PROBLEMS CONNECTED WITH THE INHIBITED OXIDATION THEORY

Yu. A. Shlyapnikov *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 73-78 refs (For availability see N73-17129 08-06)

The oxidative reactions of organic compounds and polymers are discussed in terms of free radical mechanisms, with particular emphasis on initiation, inhibition, and stabilization phenomena. Author

N73-17137 Centre National de la Recherche Scientifique, Bellevue (France). Lab. de Chimie des Radiations.

MECHANISM OF PEROXIDATION OF POLYMERS

Adolphe Chapiro *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 79-83 refs (For availability see N73-17129 08-06)

The irradiation of polymers in the presence of air leads to polymeric hydroperoxides POOH and diperoxides POOP. When such irradiated polymers are used to initiate the polymerization of a monomer, hydroperoxides generate equal amounts of graft copolymer and homopolymer, whereas diperoxides only generate graft copolymer. This technique was used to study the peroxidation of various polymers under different irradiation conditions. It was found that polypropylene irradiated at temperatures ranging from 10 to 60 C undergoes hydroperoxidation by a chain reaction. At 0 C and below (in the vitreous polymer) polymeric radicals are formed but remain trapped. Poly(vinyl chloride) also leads to hydroperoxides when irradiated at 20 to 60 C but no chain process develops below the glass transition temperature. Irradiation of the plasticized polymer leads to a hydroperoxidation by a short chain mechanism. It is concluded that the propagation of the hydroperoxidation chain, involving hydrogen abstraction by PO2 radicals, only occurs when the mobility of polymeric segments is sufficient to ensure the interaction of PO2 with neighboring molecules. Author

N73-17138 Centre National de la Recherche Scientifique, Strasbourg (France). Centre de Recherches sur les Macromolecules.

OXIDATIVE DEGRADATION OF POLYMERS AND ORGANIC COMPOUNDS VIA UNIMOLECULAR DECOMPOSITION OF PEROXY RADICALS

Jean Marchal *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 85-94 refs (For availability see N73-17129 08-06)

Autoxidation of various polymers and organic compounds is shown to include, already at room temperature, chain scissions involving unimolecular decomposition of secondary and tertiary peroxy radicals. Rate and product data are consistent with a scheme including a six-membered ring transition state leading to three fragments, one of them being an alkoxy radical. This oxidative degradation scheme at room temperature does not correspond to a known mechanism. Author

N73-17139 Stanford Research Inst., Menlo Park, Calif.

MECHANISMS OF OXIDATION OF POLYOLEFINS BELOW 150 C

Frank R. Mayo *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 95-99 refs (For availability see N73-17129 08-06)

Knowledge about oxidations of simple aliphatic hydrocarbons below 150 C is applied to oxidations of bulk polyolefins. The principal difference between these groups is due to the production of initiating radicals in pairs and to the greatly restricted mobilities of all radicals. Data are given for the efficiency of initiation by di-t-butylperoxy oxalate of the oxidation of atactic polypropylene at 45 C and for the effect of peroxide concentration on efficiency and kinetic chain length. The following other topics are discussed: chain propagation and geminate and statistical termination by alkylperoxy radicals, nonterminating reactions of two tertiary alkoxy radicals, formation and reactions of alkoxy radicals, sensitivity of oxidation products to further oxidation, intramolecular propagation of alkylperoxy radicals, and the question of the formation of carbonyl groups in oxidations of polyolefins. Author

N73-17140* Clarkson Coll. of Technology, Potsdam, N.Y.

POLYMER-GAS REACTIONS (AIR POLLUTANTS: NO2 AND SO2) AS FUNCTION OF PRESSURE, UV LIGHT, TEMPERATURE, AND MORPHOLOGY: A SURVEY

H. H. G. Jellinek *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 101-110 refs Sponsored in part by NASA and PHS (For availability see N73-17129 08-06)

CSCL 07D

Reactions of various polymers, such as polystyrene and its stereo-specific isomers, butylrubber, nylon, etc., with nitrogen dioxide and sulfur-dioxide were studied over the past few years. More recently, work has been initiated on the influence of polymer morphology on degradation of polymers in presence of these gases, near UV radiation and oxygen. Unexpected effects have been observed during chain scission near room temperature. Thus, for instance, isotactic polystyrene of various crystallinities, as far as extent and type are concerned, show marked differences in their degradation characteristics. Thus, for instance, crystalline polymers show faster degradation than amorphous ones, which seems to be contrary to expectations. However, this phenomenon can be explained in quite a consistent manner. The importance of all these reactions in connection with air pollution is briefly discussed. Author

N73-17141 City Univ., London (England).

CONTROLLED GASEOUS OXIDATIONS OF ORGANIC COMPOUNDS

C. F. Cullis *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 111-119 refs (For availability see N73-17129 08-06)

The homogeneous gaseous oxidation of organic compounds generally leads to a wide variety of products and this may be ascribed not only to the occurrence of a number of consecutive and concurrent reactions but also to the fact that the various constituent elementary steps tend to interact with one another in complex ways. Several methods are outlined for minimizing the extent of unwanted consecutive reactions but it appears to be much more difficult to restrict undesirable concurrent reactions. Several examples are given of the use of isotopic tracer techniques in the unravelling of the mechanism of complex gaseous oxidation reactions. Author

N73-17142* Stanford Research Inst., Menlo Park, Calif. Dept. of Thermochemistry and Chemical Kinetics.

SOME CURRENT PROBLEMS IN OXIDATION KINETICS

Sidney W. Benson *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 121-130 refs (For availability see N73-17129 08-06)

(Contract NAS7-472; Grant AP-00353-06)

CSCL 07D

Experimental data in low temperature and high temperature oxidations are examined from the point of view of reported quantitative inconsistencies. Activation energies for tBuO2 metathesis reactions with alkanes appear to be 7 kcal/mole higher than for comparable reactions of HO2. Related isomerization reactions are examined in the light of these differences without reaching any simple conclusions. The Russell mechanism for a 6-membered, cyclic, transition state for termination of primary and secondary alkyl peroxy radicals is shown to be either inconsistent with thermochemical data, or else unique to solution reactions. Addition reactions of O3 with olefins and acetylenes are shown thermochemically to have the possibility of following concerted and biradical pathways, respectively. Recent data showing strong inhibition by PbO coated surfaces of both oxidation and pyrolysis of i-C4H10 are examined in terms of mechanism. Author

N73-17143 Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

KINETICS AND MECHANISMS OF FLAMES AND FLAME SUPPRESSION

R. M. Fristrom *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 131-141 refs (For availability see N73-17129 08-06)

(Grant NSF GI-12)

The processes important in gas phase combustion are surveyed with emphasis on chemical kinetics. Reaction schemes are outlined for some typical simple gas phase flames and these are related to the complex chemistry of the polymer combustion. A discussion is given of possible mechanisms for gas phase flame inhibition. Sources of information on chemical kinetics are listed and a bibliography is given of compilations of gas phase chemical kinetic rate parameters. Author

N73-17144 Gottingen Univ. (West Germany). Inst. fuer Physikalische Chemie.

CARBON FORMATION IN PREMIXED FLAMES

K. H. Homann *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 143-151 refs (For availability see N73-17129 08-06)

The processes are surveyed leading to the formation of solid soot particles in premixed flames. Like most combustion products carbon formation is not exclusively determined by flame chemistry but is also dependent on transport processes. A local increase in the overall C/O ratio in the burning zone which is connected

to the back diffusion of hydrogen and hydrogen atoms can reinforce carbon formation. This gives rise to the different types of carbon appearance in burner flames. It is shown that the C/O ratio at the site of carbon formation can be very different from that of the initial mixture. The study is restricted to the formation of carbon in premixed laminar flames of various fuels, mostly hydrocarbons. Author

N73-17145 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
FLUOROCARBON COMBUSTION, FLUORINE SUPPORTED COMBUSTION KINETICS c33
Edward A. Fletcher *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 153-158 refs (For availability see N73-17129 08-06)

Some interesting characteristics of the combustion behavior of Freons, and fluorocarbons are presented. The flame speeds and spontaneous ignition limits of chlorine burning in fluorine are easily described by simple models using well characterized kinetics. The flame speeds of CF3Cl-F2 and CF3Br-F2 mixtures can be discussed in terms of simple thermal theories. The striking differences in the combustion behavior of homologous fluorocarbons are shown to depend on big differences in the rates at which the fuel molecules are initially attacked by the competitive combustion reactions, but the kinetics are not yet understood. Author

N73-17146 General Electric Co., Schenectady, N.Y. Corporate Research and Development.
BURNING OF POLYMERS c33
C. P. Fenimore and F. J. Martin *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 159-170 refs (For availability see N73-17129 08-06)

After a rod of solid polymer mounted vertically in a slowly rising stream of oxidant/inert gas mixture is ignited at the top end, the oxidant content of the mixture may be varied until that composition is found which will just support burning down the whole length of the sample. For many polymers this limiting volume-fraction of oxidant can be determined with a precision of about one percent and it serves as a convenient measure of flammability of the material. Experiments are discussed which show that the simplest model for such burning is one in which the oxidant does not react directly with the polymer, but is consumed in a nearby flame zone which heats and pyrolyzes the polymer to yield fuel gases. Other information that can be derived from these experiments is reviewed and the simple model for two-stage candle-like burning is presented. Author

N73-17147 Naval Ordnance Lab., White Oak, Md.
PYROLYSIS AND COMBUSTION OF CELLULOSIC MATERIALS c33
Raymond Alger *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 171-183 refs (For availability see N73-17129 08-06)

Despite centuries of experience with burning cellulosic materials, there is still disagreement on the interpretation of observations. These divergencies of opinion generally involve mechanisms at the microscopic level where areas of ignorance still abound. The review deals with some of these opinions and the supporting experimental evidence pertinent to three chronologically related areas of fire research; namely, pyrolysis, ignition, and fire spread. Some of the ignition concepts and the models for fire spread are not limited to cellulose but should apply to a variety of solids. Author

N73-17148 Stevens Inst. of Tech., Hoboken, N.J. Combustion Lab.
THE SURFACE PYROLYSIS BOUNDARY CONDITION FOR THE COMBUSTION OF POLYMERS c33
R. F. McAlevy, III and W. S. Blazowski *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 185-192 refs (For availability see N73-17129 08-06)
(Contract Nonr-263(48))

The pivotal boundary conditions for polymer combustion involve the surface pyrolysis-vaporization characteristics. Generally, conditions at the burning surface are so different from those encountered in classical bulk pyrolysis experiments that these data cannot be extrapolated reliably; data must be obtained at the conditions of interest. A critical review of experiments designed to produce such data, and the possible interpretations of these data are presented. A combustion self-heating technique is employed. In the experiment a planar diffusion flame is established between an axi-symmetric, stagnation-point flow of oxidant and the pyrolysis-product vapors emerging from the polymer surface lying below. The surface temperature, regression rate, and oxidant mass flow rate (the principal control variable) are measured. Recent results of this experiment are presented and discussed. Author

N73-17149*# Florida Univ., Gainesville.
AN INVESTIGATION OF THE PREPARATION OF HIGH MOLECULAR WEIGHT PERFLUOROCARBON POLYETHERS Final Report
Richard OB. Watts and Paul Tarrant [1972] 63 p
(Contract NAS7-730)
(NASA-CR-130552) Avail: NTIS HC $5.25 CSCL 07D

High molecular weight perfluorocarbon polyether gums were obtained by photolysis of perfluorodienes and discyl fluorides containing a perfluorocarbon polyether backbond. The materials obtained are represented by chemical formulas. A method was developed whereby reactive acyl fluoride and trifluorovinyl end groups are converted into inert structures. In order to investigate the possible preparation of difunctional molecules which may be useful in polymer synthesis, the reactions of hexafluoropropene oxide (HFPO) with Grignard and organolithium reagents have been studied. Reactions of various nucleophilic reagents with HFPO were also investigated. Author

N73-17150# National Bureau of Standards, Washington, D.C. Analytical Chemistry Div.
STUDIES OF CALIBRATION STANDARDS USED IN THE DEPARTMENT OF DEFENSE EQUIPMENT OIL ANALYSIS PROGRAM
Danold W. Golightly and Joseph L. Weber, Jr. Jan. 1973 47 p
(NBS-TN-751) Avail: SOD $0.75 domestic postpaid or $0.50 GPO bookstore

Organo-metallic calibration standards and diluent oil used in the Department of Defense Equipment Oil Analysis Program are discussed. Consultation on standards has been provided, and measurements of physical properties of base oil, concentrations of major elements in standards, concentrations of trace contaminants, and stability of solution have been performed. Results of studies accomplished in fiscal year 1972 are detailed. Author

N73-17151# Technischen Universitaet, Munich (West Germany). Faktultaet fuer Allgemeine Wissenschaften.
PRODUCTION AND CHARACTERIZATION OF ZIRCONIUM PHOSPHATE ION EXCHANGER PREPARATIONS IN REGARD TO ISOLATION OF HIGHLY ACTIVE ACTINIDE ELEMENTS Ph.D. Thesis [HERSTELLUNG UND CHARAKTERISIERUNG VON ZIRKONPHOSPHAT-IONENAUSTAUSCHER-PRAEPARATEN IM HINBLICK AUF DIE ISOLIERUNG HOCHAKTIVER AKTINO IDENELEMENTE]
Josef Treplan 1972 112 p refs In GERMAN
Avail: NTIS $7.75

The optimal molecular composition of zirconium phosphate to obtain an ion exchange capacity for three valent ions is reported. A stoichiometric composition of P : Zr = 2 : 1 provides an ion exchange capacity of up to 3.1 mval/g (pH = 4) for one valent- and three valent-ions in elution chromatography of radioactive actinide series elements. Transl. by G.G.

N73-17152# Technischen Universitaet, Munich (West Germany).
CONTRIBUTION TO THE ELIMINATION OF MERCAPTANES FROM EXHAUST GASES Ph.D. Thesis [BEITRAG ZUR BESEITIGUNG VON MERCAPTAN AUS ABGAS]
Karl Buerkert 1972 20 p refs In GERMAN
Avail: NTIS HC $3.00

Reactions of ethyl mercaptane with ozone and ozone-water vapor are studied for their mechanisms, stoichiometries, initial velocities, and activation energies. Measurements on stable and flowing mercaptane-ozone gas mixtures in a reactor at temperatures between 20 and 50 C and for mercaptane concentrations between 1 to 10 ppm show that the reaction is inhibited by the development of diethyl sulfides which in turn react with the

unused ozone. Addition of water vapor increases reaction velocity and produces twice as much diethyl sulfide as well as acetaldehyde, diethyl disulfide, and sulfuric acid and thus contributes to atmospheric fog formation. Transl. by G.G.

N73-17153*# Sandia Corp., Albuquerque, N.Mex.
FORMALDEHYDE BASE DISINFECTANTS Patent Application
Ralph E. Trujillo, inventor (to NASA) Filed 30 Jan. 1973 19 p Sponsored by NASA
(NASA-Case-NPO-12115-1; US-Patent-Appl-SN-327982) Avail: NTIS HC $3.00 CSCL 07A

New formaldehyde based disinfectants are formed by passing formaldehyde gas through a highly polar organic solvent such as dimethyl sulfoxide (DMSO) or dimethyl formamide (DMF) to form a gel-like polymer or by heating paraformaldehyde in the presence of a polar organic polyhydroxy solvent such as glycerol ethylene glycol or propylene glycol. The disinfectants exhibit disinfection properties against bacterial vegetative cells, bacterial spores and soil organisms but are absent the penetrating odor and eye and ear irritation that is characteristic of other forms of formaldehyde. NASA

N73-17154*# Kanner (Leo) Associates, Redwood City, Calif.
KINETICS OF CYANOETHYLATION OF HCN ON HETEROGENEOUS CATALYSTS
N. A. Dalin, B. R. Serebryakov, A. G. Konovalchukov, L. S. Akimova, and A. Gadzhily Washington NASA Feb. 1973 8 p refs Transl. into ENGLISH from Dokl. Akad. Nauk Azerb. SSR (Baku), v. 23, no. 1, 1967 p 18-21
(Contract NASw-2481)
(NASA-TT-F-14690) Avail: NTIS HC $3.00 CSCL 07D

Results are presented from a study of the cyanoethylation of HCN on ion exchange resins. Reaction times were sufficient for 100% conversion. Author

N73-17155*# Kanner (Leo) Associates, Redwood City, Calif.
MEASUREMENT OF THE EFFECT OF ADDITIVES ON REDUCING ZINC CORROSION IN KOH
M. Cenek and O. Kouril Washington NASA Feb. 1973 61 p refs Transl. into ENGLISH from Czechoslovakian Rept.
(Contract NASw-2481)
(NASA-TT-F-14693) Avail: NTIS HC $5.25 CSCL 07D

The effect of Hg2(+), Pb2(+), Cd2(+), Ag(+) and Sn(+) on Zn corrosion in KOH solutions is studied. Results are obtained through passivation of the Zn surface and the measurement of Zn corrosion in the KOH solution of given concentration. Some of the main results are: (1) Zn corrosion increases approximately linearly with decreasing KOH concentration and increasing electrolyte temperature up to 45 C, and nonlinearly above this temperature; (2) the additives SiO2 and LiOH.H2O, which decelerate the aging of saturated zincate electrolytes, also reduce Zn corrosion; and (3) all passivation metals used reduce the corrosion of the Zn surface. The passivating effect of HgCl2 was most pronounced. Author

N73-17156# Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Chemistry.
NUCLEAR CHEMISTRY AND GEOCHEMISTRY RESEARCH Progress Report, 1971-1972
Truman P. Kohman and Paul J. Karol 31 May 1972 81 p refs
(Contract AT(11-1)-3236)
(COO-3236-3) Avail: NTIS

The following research is reported: (1) proton reactions with argon, beryllium, chlorines, fluorine, iron, magnesium, phosphorus, silicon, sodium, and sulfur for separation from argon gas and other radionuclides; (2) radioactivity measurements on calcium 48; (3) design and performance of solid gamma spectrometers and pulse analyzers; (4) data processing system for alpha spectra; (5) structural analyses on meteorites and tektites; (6) lead isotope distribution for authentication of art works; and (7) nucleosyntheses of transuranium elements. G.G.

N73-17157# Aerospace Corp., El Segundo, Calif. Aerodynamics and Propulsion Research Lab.
MONTE CARLO CALCULATIONS OF REACTION RATES H PLUS HF(v) YIELDING H2(v PRIME) PLUS F AND H PLUS HF(v) YIELDING HF(v PRIME) PLUS H Final Report, Jan. - Jun. 1972
Roger L. Wilkins 15 Nov. 1972 30 p refs
(Contract F04701-72-C-0073)
(AD-751910; TR-0073(3430)-7; SAMSO-TR-72-265) Avail: NTIS CSCL 07/4

A total of 10,000 three-dimensional classical trajectories on a semi-empirical potential energy surface were computed for collisions of H atoms with vibrationally excited hydrogen fluoride. Analysis of the reactive trajectories indicates that multiple quantum jumps are significant in the reactions of H atoms with vibrationally excited HF, chemical effects provide an important mechanism for the efficient relaxation of HF in collision with H, and the deactivation rates are extremely fast. Both theory and experiment indicate that the rate of deactivation of vibrationally excited hydrogen fluoride is amost gas kinetic. Rate coefficients are provided for many reactions that have not been measured experimentally. Author (GRA)

N73-17158# Naval Ordnance Lab., White Oak, Md.
CRITICAL TRANSPORT PROPERTIES IN THE BINARY LIQUID PHASE TRANSITION
Robert Perl 7 Sep. 1972 114 p refs
(AD-752473; NOLTR-72-208) Avail: NTIS CSCL 07/4

When the liquid having the critical concentration of each component is cooled below the critical temperature it begins to form two phases, separated by a well defined meniscus. Through various fluctuation-dissipation theorems, it is possible to relate critical transport coefficients to time and space integrals of correlation functions of the relevant fluxes. The anomaly in the critical transport properties is thus attributed to the cooperation of two effects: The anomalous increase in the large-scale fluctuations of concentration variables contained in the flux; and The anomalous increase in the lifetimes associated with these fluctuations. GRA

N73-17913* National Bureau of Standards, Boulder, Colo.
PART A: HYDROCARBON SUSPENSION IN SLUSH HYDROGEN
Charles F. Sindt *In its* Mixing and Heat Transfer Characteristics of Slush Hydrogen 10 Nov. 1972 p 3-26 refs (For availability see N73-17912 08-33)
CSCL 07D

07 COMMUNICATIONS

Includes communications equipment and techniques; noise; radio and communications blackout; modulation telemetry; tracking radar and optical observation; and wave propagation. For basic research see: 23 Physics, General; and 21 Navigation.

N73-17159 Texas Univ., Austin.
THE SCATTERING FROM ROUGH CURVED SURFACES OF A WAVE PROPAGATED THROUGH A RANDOM MEDIUM Ph.D. Thesis
Darryl Paul Greenwood 1971 89 p
Avail: Univ. Microfilms Order No. 72-15766

A generalized investigation of wave scattering from rough surfaces yields an expression for mean scattered power flux which is the spatial Fourier transform of the product of three transfer functions: (1) the optical transfer function of the propagating medium; (2) the joint characteristic function of the surface roughness; and (3) a coherence involving the mean surface and the wave profile. The solution is applied to laser scattering from aluminum and titanium airplane surfaces where the medium is the clear atmosphere. Dissert. Abstr.

N73-17160*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
THE DEEP SPACE NETWORK, VOLUME 13 Progress Report, Nov. - Dec. 1972
15 Feb. 1973 257 p refs
(Contract NAS7-100)
(NASA-CR-130721; JPL-TR-32-1526-Vol-13) Avail: NTIS HC $15.00 CSCL 22D

The objectives, functions, and organization of the Deep

Space Network are summarized. The deep space instrumentation facility, the ground communications facility, and the network control system are described. Other areas reported include: Helios Mission support, DSN support of the Mariner Mars 1971 extended mission, Mariner Venus/Mercury 1973 mission support, Viking mission support, radio science, tracking and ground-based navigation, network control and data processing, and deep space stations. F.O.S.

N73-17161*# General Electric Co., Philadelphia, Pa.
UNIVERSAL VOICE PROCESSOR DEVELOPMENT Final Report
4 Dec. 1972 35 p refs
(Contract NAS9-11961)
(NASA-CR-128739; SE343T) Avail: NTIS HC $3.75 CSCL 17B

The development of a universal voice processor is discussed. The device is based on several circuit configurations using hybrid techniques to satisfy the electrical specifications. The steps taken during the design process are described. Circuit diagrams of the final design are presented. Mathematical models are included to support the theoretical aspects. Author

N73-17162# Joint Publications Research Service, Arlington, Va.
ERECTION AND TESTING OF A ZONAL SIGNAL ENHANCER ON THE CHOLLON-ATA-ORGOCHUR RADIO RELAY LINE
M. Baybosunov, O. Mamayev, T. Orozobakov, and M. Turusbekov 23 Jan. 1973 6 p ref Transl. into ENGLISH from Elektrosvyaz (Moscow,) no. 5, 1972 p 16-17
(JPRS-58044) Avail: NTIS HC $3.00

Data on the erection and testing of a zonal signal enhancer on a microwave radio relay line are presented. Author

N73-17163# Federal Aviation Administration, Washington, D.C.
ENGINEERING AND DEVELOPMENT PROGRAM PLAN: AIR TRAFFIC CONTROL SURVEILLANCE RADAR
Harry C. Moses Dec. 1972 65 p refs
(FAA-ED-02-1) Avail: NTIS HC $5.25

The role of the primary radar system in air traffic control operations is discussed. Emphasis is placed on the performance deficiencies and the technical development programs undertaken to eliminate the deficiencies. The compliance of the radar with the air traffic control surveillance requirements is analyzed. Author

N73-17164*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Telecommunications Div.
THE MARINER MARS 1971 RADIO FREQUENCY SUBSYSTEM
R. S. Hughes 1 Dec. 1972 51 p ref
(Contract NAS7-100)
(NASA-CR-130866; JPL-TM-33-573) Avail: NTIS HC $4.75 CSCL 17B

The radio frequency subsystem (RFS) for the Mariner Mars 1971 (MM'71) spacecraft is described. The MM'69 RFS was used as the baseline design for the MM'71 RFS, and the report describes the design changes made to the 1969 RFS for use on MM'71. It also cites various problems encountered during the fabrication and testing of the RFS, as well as the types of tests to which the RFS was subjected. In areas where significant problems were encountered, a detailed description of the problem and its solution is presented. In addition, some recommendations are given for modifications to the RFS and test techniques for future programs. Author

N73-17165# Admiralty Surface Weapons Establishment, Portsmouth (England).
CURVES RELATING TO LOW ANGLE PROPAGATION OVER THE SEA
E. Denison Aug. 1972 52 p refs
(TR-72-31; BR-32468) Avail: NTIS HC $4.75

Curves to assist in solving low angle radar and one way transmission problems are presented. They give the ratio in decibels of the power after transmission to a range R kilometers and back, over the sea, to the power after transmission over the same range in free spaces. Each curve is for a specified radar antenna height, target height, and operating wavelength. The principal operating wavelengths cover from 1.4 meters down to 0.0088 meters. Target heights covered are 1, 3, 10, 30, 100 and 300 meters while antenna heights are 15, 20, 25, 30 meters or 10, 15, 20 meters depending on the waveband. ESRO

N73-17166# European Space Operations Center, Darmstadt (West Germany).
PRINCIPLES OF SPACECRAFT TELEMETRY DATA MANAGEMENT
H. G. Walter Jul. 1972 35 p refs
(ESRO-TN-121-ESOC) Avail: NTIS HC $4.00

The data processing system for experimenters is reviewed, and a general concept which could meet the requirements of the mid-seventies is outlined. ESRO

N73-17167*# Ampex Corp., Redwood City, Calif. Corporate Research Dept.
FOIL BEARING INVESTIGATION: AN INVESTIGATION OF HEAD TO TAPE SEPARATION IN MAGNETIC RECORDING
A. Eshel and A. R. Lowe Jun. 1972 39 p refs Sponsored in part by NASA and AEC
(Contract N00014-71-C-0001; NR Proj. 062-297)
(NASA-CR-130536; AD-745005; RR-72-05) Avail: NTIS $4.00 CSCL 14/3

Although the mathematical model of a tape travelling over a cylinder (foil bearing) has been shown experimentally to be valid for a closely similar physical model, its application to predict separation between a tape and a magnetic head shows large discrepancies. In this work, a modified model of a foil bearing, taking into account some details of the particular geometry of magnetic heads, is used to predict separation. As a result, the gap between theory and experiment is narrowed down considerably. Author (GRA)

N73-17168# Colorado Univ., Boulder.
FLIGHT SAFETY ASPECTS OF PRECISION RADAR NEAR AIR BASES IN BIRD-AIRCRAFT COLLISION AVOIDANCE Technical Report, 18 Jun. 1970 - 1 Feb. 1972
Warren L. Flock Kirtland AFB, N. Mex. AFWL Oct. 1972 67 p refs
(Contract F29601-70-C-0076)
(AD-751985; AFWL-TR-72-25) Avail: NTIS CSCL 17/9

The utility of a GEC-AEI No. 654 radar for warning of bird hazards at airfields has been evaluated at Gunbarrel Hill and Valmont Reservoir, near Boulder, Colorado, from 16 March to 19 December 1971. Morning and evening flights of Mallards, Canada Geese, etc., provide good test radar targets at these locations. The 654 radar is useful as it is, but improvements are recommended to allow detection of birds at greater ranges. Some Doppler radar signature data were also taken with a CW radar at Baller Lake in spring 1971. Experience with this radar provides a basis for recommending further development of signature capability. Such capability should allow determining quickly if a target is caused by birds or not, the type or size of bird, and whether the echo is from one or a small or large number of birds. Author (GRA)

N73-17169# Southwest Research Inst., San Antonio, Tex.
A SEISMIC COMMUNICATIONS INVESTIGATION EMPLOYING A PIEZOELECTRIC TRANSDUCER Final Report, Nov. 1971 - Jul. 1972
Craig C. Johnson Griffiss AFB, N. Y. Sep. 1972 57 p refs
(Contract F30602-72-C-0100; SRI Proj. 14-3261)
(AD-752218; RADC-TR-72-241) Avail: NTIS CSCL 17/2

The purpose of this effort was to investigate the feasibility of employing a piezoelectric transducer for seismis communications in mine environments. The transducer incorporated a high Q, spring-mass resonator to load the air side of the piezoelectric crystal. The resonant frequency was seismic load dependent and fell in the range of 300 to 340 Hz. The effort included a mathematical analysis of the transducer, with corroborative laboratory tests, together with actual communications experiments performed first in an open-formation limestone quarry and finally in an operating iron mine. Author (GRA)

N73-17170# Lincoln Lab., Mass. Inst. of Tech., Lexington.
A THEORY FOR OPTIMAL MOVING TARGET INDICATOR

(MTI) DIGITAL SIGNAL PROCESSING, SUPPLEMENT 1
Robert J. McAulay 31 Oct. 1972 22 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-751923; TN-1972-14-Suppl-1; ESD-TR-72-243-Suppl-1)
Avail: NTIS CSCL 17/9

In the report, A Theory for Optimal MTI Digital Signal Processing. Part I. Receiver Synthesis, (1), the problem of eliminating scanning ground clutter from an aircraft surveillance radar was examined from a statistical decision theoretical point of view. An optimum processor was derived which could be approximated by a clutter filter followed by a discrete Fourier transform (DFT). In the report, additional numerical work is documented that compares the performance of the pulse cancellers with feedback and the DFT with that of the optimum processor. The issue of coherent vs incoherent integration gain is considered by comparing the filters only on their ability to reject clutter. A clutter rejection improvement factor is defined and used to compare the various filters. It is shown that the pulse cancellers can be quite effective in rejecting clutter provided the input clutter power is not too large and that additional gains are possible using the DFT. Author (GRA)

N73-17171# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
A ROBUST DETECTION SCHEME WITH LEARNING OF THRESHOLDS FOR AMPLITUDE SHIFT KEYED SIGNALS
J. Krishnamurthy and M. Arozullah Sep. 1972 40 p refs
(Contract N00014-70-A-0311-0002; NR Proj. 042-274)
(AD-752009; TR-72-2) Avail: NTIS CSCL 09/4

A robust detection scheme, called Detection Scheme with Learning of Thresholds (DSLT), for the detection of M-ary Amplitude Shift Keyed Signals is proposed and analyzed. It is shown that DSLT performs better (in the sense of lower probability of error) than the Detection Scheme with Fixed Thresholds. The improvement in performance is due to the fact that DSLT assumes a priori information regarding the approximate form of noise distribution, unlike DSFT. The performance of DSLT is independent of the mean value of the noise, unknown amounts of DC drifts and intersymbol interference if it can be assumed that the intersymbol interference can be replaced by an unknown constant. Author (GRA)

N73-17172# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
RESEARCH ON SPEECH COMMUNICATION, 3 Final Report, 1 Jan. - 30 Jun. 1972
Kenneth N. Stevens 28 Sep. 1972 18 p refs
(Contract F19628-72-C-0181; AF Proj. 5628)
(AD-752244; AFCRL-72-0577) Avail: NTIS CSCL 17/2

The work includes studies of certain temporal properties of speech sounds in various contexts, development of improved configurations for speech synthesizers, investigation of source of inter- and intra-speaker variability with application to speaker recognition systems, and continued development of an interactive computer-based facility for speech analysis and synthesis. Author (GRA)

N73-17173# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
ROBUST DETECTION SCHEMES FOR FREQUENCY SHIFT KEYED AND PHASE SHIFT KEYED SIGNALS
J. Krishnamurthy and M. Arozullah Sep. 1972 104 p refs
(Contract N00014-70-A-0311-0002; NR Proj. 042-274)
(AD-752010; TR-72-3) Avail: NTIS CSCL 09/4

Two Robust Detection Schemes for the detection of a class of time varying signals in additive disturbance are proposed and analyzed and their performance is evaluated. The proposed detection schemes, called Robust Detection Scheme I (RDSI) and Robust Detection Scheme II (RDSII) are applicable when the samples of the received signal or a filtered version of the received signal contain pure signal components that are all equal. It is shown that both binary and M-ary Phase Shift Keyed and Frequency Shift Keyed Signals can be detected by using RDSI and RDSII. The performance of the detectors is compared with that of the Mean and Sign detectors. It is observed that the proposed detectors generally lead to lower probability of error, except when the Mean and the Sign detectors are the Maximum Likelihood detectors. Analytical expressions for the average probability of error, the asymptotic relative efficiency and the asymptotic efficiency are derived and it is shown that the proposed detectors are superior or equivalent to the Sign detector and superior to the Mean detector in nongaussian noise. Author (GRA)

N73-17174# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
NONPARAMETRIC DETECTION OF M-ARY PULSE AMPLITUDE MODULATED (PAM) SIGNALS IN THE PRESENCE OF INTERSYMBOL INTERFERENCE
S. S. Abuskhairoon and M. Arozullah Sep. 1972 83 p refs
(Contract N00014-70-A-0311-0002; NR Proj. 042-274)
(AD-752011; TR-72-4) Avail: NTIS CSCL 09/4

A class of nonparametric detectors for detecting M-ary time varying signals in the presence of intersymbol interference and additive noise of unknown distribution is formulated, evaluated and compared to optimum Gaussian detector. The proposed detectors use a transformation of the sample observations to calculate a test statistic M. A decision method based on the value of the test statistic is devised by defining appropriate thresholds. An analytical expression for the average probability of error is presented and the method of calculating optimum thresholds that minimize the probability of error is also developed. The probability of error obtained is independent of the form of the noise distribution but depends on the value of the density function at the median. This detector requires independent samples. The performance of these detectors is independent of the noise distributions. An example of a ternary signal set is worked out for illustration. Author (GRA)

N73-17175# New York Univ., N.Y. Dept. of Electrical Engineering and Computer Science.
NONLINEAR AND TURBULENT WAVE PHENOMENA Annual Report, 30 Jun. 1971 - 31 Aug. 1972
N. Marcuvitz Oct. 1972 14 p refs
(Contract N00014-67-A-0467-0018; NR Proj. 371-147)
(AD-752149) Avail: NTIS CSCL 20/14

This Annual Report outlines work on microwave scattering from hydrodynamically induced turbulence in plasma, numerical analysis of nonlinear dispersive systems, scattering techniques for analysis of turbulent systems and use of quasi particle methods in nonlinear wave propagation. This program of research is directed toward analysis of wave propagation in nonlinear turbulent media of finite geometry. Author (GRA)

N73-17176# Naval Ship Engineering Center, Philadelphia, Pa.
DEVELOPMENT OF A TELEMETRY SYSTEM UTILIZING INTEGRATED CIRCUITRY
Mario D. Dianora 1 Sep. 1972 28 p
(AD-752481; NAVSECPHILADIV-FA-308) Avail: NTIS CSCL 09/6

A telemetry system employing integrated circuits was investigated and developed. The system uses digital transmission techniques for high accuracy and reliability. In addition, time division multiplexing permits the transmission of many channels of data on a single radio frequency carrier. To increase the system's usefulness, automatic internal calibration circuitry was incorporated. A developmental model was constructed and successfully tested. Author (GRA)

N73-17177# Technology Service Corp., Santa Monica, Calif.
AN IMPROVED VERSION OF THE SPECTRUM ANALYSIS AND DISPLAY COMPUTER PROGRAM
Roger M. Golden and William B. Kendall Jun. 1972 116 p refs
(Contract N00014-71-C-0033)
(AD-752113; TSC-PD-067-11) Avail: NTIS CSCL 09/4

The mathematical analysis methods used in the Spectrum Analysis and Display Computer Program are based on well-known Fourier series and Fourier integral formulations. In the report these basic analytic tools and their relation to the quantities computer by the program are described. The program displays a pictorial representation of the power spectrum of an analyzed signal, as well as estimates of: (1) the frequency within a designated frequency band at which there is a maximum in the spectral density, (2) the 6-db bandwidth about the maximum value, (3) the mean frequency within the 6-db bandwidth, (4) the

total power within the 6-db bandwidth, and (5) the equivalent signal power of a pure sinewave at the frequency corresponding to the peak in the power spectrum. The report contains a detailed description of how the program is used, and of the outputs it produces, including examples of actual program output, and a source language (FORTRAN) listing. Author (GRA)

N73-17178# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DIVERSITY TECHNIQUES FOR AIRBORNE COMMUNICATIONS IN THE PRESENCE OF GROUND REFLECTION MULTIPATH
Henry Berger and James E. Evans Sep. 1972 151 p refs
(Contract F19628-73-C-0002; AF Proj. 649)
(AD-752249; TN-1972-27; ESD-TR-72-216) Avail: NTIS CSCL 17/2

The signal power reduction due to multipath fading is an important design consideration in the development of air-air and ground-air communications links at L-band. A first order mathematical model of ground reflection multipath is used to predict the relationship between the depth of fading and environmental parameters such as surface roughness and the terminal positions relative to earth. The model is then used to investigate two techniques for reducing the loss in received signal power: frequency diversity and antenna height diversity. A measurement program to experimentally evaluate the applicability of antenna height diversity is outlined. Author (GRA)

08 COMPUTERS

Includes computer operation and programming; and data processing. For applications, see specific categories. For related information see also: 19 Mathematics.

N73-17179# Nagoya Univ. (Japan). Inst. of Plasma Physics.
GRAPHICAL DISPLAY OF DATA ON MAGNETIC TAPE COMPUTED BY HITAC 8500 COMPUTER, USING FACOM 230-35 COMPUTER AND FACOM 6232A GRAPHIC DISPLAY
H. Toyama, H. Toyosaka, and K. Tsuda Oct. 1972 21 p refs
(IPPJ-T-10) Avail: NTIS HC $3.25

A combination of FACOM graphic display system and magnetic tape data from HITAC 8500 is reported. Data are computed on the HITAC 8500 and results written on magnetic tape are then read and displayed using FACOM on-line graphics. Author

N73-17180*# National Aeronautics and Space Administration, Washington, D.C.
MATHEMATICAL COMPUTER PROGRAMS: A COMPILATION Technology Utilization
[1972] 14 p
(NASA-SP-5913(02)) Avail: NTIS HC $1.00 CSCL 09B

Computer programs, routines, and subroutines for aiding engineers, scientists, and mathematicians in direct problem solving are presented. Also included is a group of items that affords the same users greater flexibility in the use of software. E.H.W.

N73-17181*# Memphis State Univ., Tenn.
COMPUTER PROGRAMS FOR THE SOLUTION OF SYSTEMS OF LINEAR ALGEBRAIC EQUATIONS
William T. Sequi Washington NASA Jan. 1973 251 p refs
(Contract NCA8-44)
(NASA-CR-2173) Avail: NTIS HC $3.00 CSCL 09B

FORTRAN subprograms for the solution of systems of linear algebraic equations are described, listed, and evaluated in this report. Procedures considered are direct solution, iteration, and matrix inversion. Both incore methods and those which utilize auxiliary data storage devices are considered. Some of the subroutines evaluated require the entire coefficient matrix to be in core, whereas others account for banding or sparseness of the system. General recommendations relative to equation solving are made, and on the basis of tests, specific subprograms are recommended. Author

N73-17182# Technischen Universitaet, Munich (West Germany).
A SYSTEM PROGRAM FOR CONTROL OF REAL TIME FORTRAN PROGRAMS Ph.D. Thesis [EIN PROGRAMMSYSTEM ZUR UEBERWACHUNG VON ECHTZEIT-FORTRAN PROGRAMMEN]
Emmanuel Angelidis 1972 25 p In GERMAN
Avail: NTIS HC $3.35

The development of an on-line dialog and testing system is reported that controls real time FORTRAN programs during simulation by static, dynamic, and hybrid-specific methods. A time register interrupt routine measures real program run time at a precision of two memory cycles without affecting the address flow to the test object. Transl. by G.G.

N73-17183# Australian Post Office Research Labs., Melbourne.
GENERATION OF FAST PSEUDO-RANDOM BINARY SEQUENCES AT HIGH BIT RATES
A. Y. C. Quan Jul. 1972 16 p refs
(Rept-6707) Avail: NTIS HC $3.00

Methods of generating pseudo-random binary sequences at the highest rates permissible by the type of hardware used are examined. Techniques for reducing the propagation delay time in the modulo-two feedback, which forms part of a conventional p.r.b.s. generator, and a method for multiplying the basic bit rate of the p.r.b.s. are described. Author

N73-17184*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
PATTERN RECOGNITION: A BASIS FOR REMOTE SENSING DATA ANALYSIS
Philip H. Swain [1973] 42 p refs
(Grant NGL-15-005-112)
(NASA-CR-130757; LARS-111572) Avail: NTIS HC $4.25 CSCL 09B

The theoretical basis for the pattern-recognition-oriented algorithms used in the multispectral data analysis software system is discussed. A model of a general pattern recognition system is presented. The receptor or sensor is usually a multispectral scanner. For each ground resolution element the receptor produces n numbers or measurements corresponding to the n channels of the scanner. Author

N73-17185*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
DIGITAL RECEIVER STUDY AND IMPLEMENTATION Final Report, 1 Jun. 1971 - 1 Jun. 1972
D. A. Fogle, G. M. Lee, and J. C. Massey 1 Jun. 1972 302 p refs
(Contract NAS5-11424)
(NASA-CR-130174; MDC-E0648) Avail: NTIS HC $17.25 CSCL 09B

Computer software was developed which makes it possible to use any general purpose computer with A/D conversion capability as a PSK receiver for low data rate telemetry processing. Carrier tracking, bit synchronization, and matched filter detection are all performed digitally. To aid in the implementation of optimum computer processors, a study of general digital processing techniques was performed which emphasized various techniques for digitizing general analog systems. In particular, the phase-locked loop was extensively analyzed as a typical non-linear communication element. Bayesian estimation techniques for PSK demodulation were studied. A hardware implementation of the digital Costas loop was developed. Author

N73-17186# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
SIMULATION OF P-N JUNCTION DIODES ON A DIGITAL COMPUTER Final Report [ETUDE DES DIODES A JONCTION PN SUR CALCULATEUR NUMERIQUE]
R. Funck 22 Oct. 1971 142 p refs In FRENCH
(Contract DGRST-67-00-854)
Avail: NTIS HC $9.25

A computer program for the solution of carrier transport equations is described. It enables the calculation of transitory phenomena in an abrupt p-n junction, with or without carrier mobility phenomena and avalanche effect. The program written especially for the study of diode commutation, and low frequency oscillations in the avalanche area, makes possible the study of the high frequency alternating regime. ESRO

N73-17187# Washington Univ., St. Louis, Mo. Lab. of Control Systems Science and Engineering.
CONTROL, GUIDANCE AND INFORMATION FUNDAMENTALS OF AEROSPACE Progress Report, 1 Sep. 1971 - 31 Aug. 1972
John Zaborszky 1 Sep. 1972 27 p refs
(Contract F44620-69-C-0116; AF Proj. 9749)
(AD-751941; AFOSR-72-2168TR) Avail: NTIS CSCL 12/1

A brief summary of results is presented followed by listings of published, presented, submitted papers, of reports, and theses. Author (GRA)

09 ELECTRONIC EQUIPMENT

Includes electronic test equipment and maintainability; component parts, e.g., electron tubes, tunnel diodes, transistors; integrated circuitry; microminiaturization. For basic research see: 10 Electronics. For related information see also: 07 Communications and 21 Navigation.

N73-17188 Southern Methodist Univ., Dallas, Tex.
DEVELOPMENT OF A DEEP TRAP MODEL FOR THE CAPACITANCE CHARACTERISTICS OF SILICON p(PLUS)nn(PLUS) DIODES IRRADIATED WITH FAST NEUTRONS Ph.D. Thesis
James Stanley Crabbe 1971 220 p
Avail: Univ. Microfilms Order No. 72-16302

A deep trap model is described which accurately predicts the capacitance-voltage characteristics of silicon p(+)nn(+) diodes which have been irradiated with fast neutrons. The deep trap model assumes that the effects of the neutron fluence can be represented by two independent point defect acceptor levels introduced linearly with neutron fluence. The deep trap model is applied to evaluate the effect of fast neutron fluence on the steady state free carrier concentration, trap occupation, space charge, electric field, and potential in a p(+)n junction. Computed data are presented which describe the capacitance of a p(+)n diode as a function of trap parameters, bias voltage, measurement frequency, and neutron fluence. Dissert. Abstr.

N73-17189 Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
STUDY OF PARALLEL SNAP-OFF DIODE FREQUENCY MULTIPLIERS. COMPUTER SIMULATION OF MULTIPLIERS [ETUDE DE MULTIPLICATEURS DE FREQUENCE A DIODE SNAP OFF EN PARALLELE. SIMULATION DES MULTIPLICATEURS SUR ORDINATEUR]
J. Couet [1971] 99 p refs In FRENCH
Avail: Issuing Activity

The theoretical aspects of frequency multipliers are discussed. The behavior of the main element, the diode, at several different frequencies is analyzed as a function of the polarization. This analysis is limited to snapoff diodes. Capacity and resistance variations are expressed as a function of polarization, and a mathematical model for the diode is derived. This model is applied to diodes piloted by strong signals, and results are compared with experiment. The second element for which theoretical and experimental results are compared is the pulse generator. The performance of the fully assembled frequency amplifier is analyzed. A computer program is proposed that facilitates simulation of different parameters and evaluation of performance. ESRO

N73-17190*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
CALCULATION OF RETROREFLECTOR ARRAY TRANSFER FUNCTIONS Final Technical Report
David A. Arnold Dec. 1972 60 p
(Grant NGR-09-015-196)
(NASA-CR-130696; SAO-212-020) Avail: NTIS HC $5.00 CSCL 09E

Computer programs have been developed for calculating the transfer function of a retroreflector array. The transfer functions provide range corrections and effective reflecting areas for the retroreflector arrays carried by satellites now in orbit. This information can be used to estimate laser echo signal strengths and to correct laser range measurements in order to obtain the range to the center of mass of the satellite. The values are tabulated for various angles of incidence of the laser beam with respect to the symmetry axis of the satellite. Transfer functions have been computed for the following satellites: BE-B, BE-C, Geos 1, D1C, D1D, Geos 2, Peole, and Geos C. Author

N73-17191*# Magnavox Research Labs., Torrance, Calif.
TDRS MULTIMODE TRANSPONDER PROGRAM. PHASE 1: DESIGN Final Report, 1 Mar. - 15 Jul. 1972
Richard S. Cnossen 15 Jul. 1972 248 p refs
(Contract NAS5-20330)
(NASA-CR-130170; R-4403) Avail: NTIS HC $14.50 CSCL 09E

The use of geosynchronous tracking and data relay satellites (TDRS) which can serve both low data rate users at VHF and high data rate users at other frequencies is considered. The effects of radio frequency interference from the earth and of multipath propagation due to reflections from the earth are expected to pose problems for the TDRS system at VHF. Investigations suggest several modulation techniques that offer promise to overcome these problems. This report provides a complete design of a VHF/UHF multimode transponder and its associated ground support equipment. The transponder is designed for installation aboard an aircraft and will demonstrate candidate modulation techniques to provide the required information for the design of an eventual VHF/UHF transponder suitable for installation in a user satellite, capable of operating as part of a TDRS system. Author

N73-17192*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
MULTIBEAM ANTENNA STUDY, PHASE 1
Jack L. Bellamy 15 Dec. 1972 187 p refs
(Contract NAS5-21711)
(NASA-CR-130168; LMSC-D284597) Avail: NTIS HC $11.50 CSCL 17B

A multibeam antenna concept was developed for providing spot beam coverage of the contiguous 48 states. The selection of a suitable antenna concept for the multibeam application and an experimental evaluation of the antenna concept selected are described. The final analysis indicates that the preferred concept is a dual-antenna, circular artificial dielectric lens. A description of the analytical methods is provided, as well as a discussion of the absolute requirements placed on the antenna concepts. Finally, a comparative analysis of reflector antenna off-axis beam performance is presented. Author

N73-17193# Technischen Universitaet, Munich (West Germany). Fakultaet fuer Maschinenwesen und Elektrotechnik.
ROTATIONAL SYMMETRICAL TWO MATERIAL DIELECTRICS Ph.D. Thesis [ROTATIONSSYMMETRISCHE ZWEISTOFFDIELEKTRIKA]
Paul Weiss 1972 195 p refs In GERMAN
Avail: NTIS HC $11.75

Parallel discrete charges at both sides of the boundary layer in a two component dielectric field are used to determine their high voltage distributions in series and parallel arrangements. Theoretical calculations and experimental observations on series dielectrics show pronounced performance decrease when the boundary layer is close to the electrode and an extreme dependence of the capacity factors on the distance between electrode and boundary layer and on the correlation between the relative dielectric constants. Parallel arrangement of two component dielectrics produces an imbedding effect when electrode and boundary layer are not vertical to each other; iterative improvement of boundary layer contours results in a flash-over capacity factor of about 100%. Transl. by G.G.

N73-17194# Bhabha Atomic Research Centre, Bombay (India). Technical Physics Div.
IMAGE TUBE ASSESSMENT
V. R. Katti, L. M. Rangarajan, and G. K. Bhide 1972 39 p refs
(BARC-610) Avail: AEC Depository Libraries

An assessment of the image tube quality is made from the viewpoint of utility through a few important characteristics. They are: (1) luminous and spectral sensitivity of the photocathode, (2) electron optical focusing and resolution characteristics, (3)

distortion effects in the output image and (4) conversion capability of the device from invisible spectrum into useful visible range, particularly in respect of infrared converter tubes. A few image tubes developed at BARC as well as some commercial types of image tubes were used as experimental samples for the assessment. An attempt is made to evaluate the several conventional methods and techniques critically. The techniques and theory for determining the steady light, non-time-dependent properties of various types of photocathodes as well as the resolving power of such electro-optical devices are given. These properties are explained and descriptions of the equipment necessary to measure them with various methods are also given. Author

N73-17195# Institut Atomnoi Energii, Moscow (USSR).
INDUCTION COIL OF FINITE LENGTH FOR ABSOLUTE MEASUREMENTS OF THE ELECTROCONDUCTIVITY OF MEDIA
V. P. Kuleshov and Yu. V. Medvedev 1971 24 p refs In RUSSIAN
(IAE-2120) Avail: AEC Depository Libraries

Formulas were derived and calculated for the measurement of the impedance of single-layer induction coils of finite length. Experimental results agree well with the calculated results, which indicates the possibility of the absolute measurement of the electric conductivity with direct transducers by the method of eddy currents. Author (NSA)

N73-17196# Central Electricity Generating Board, Berkeley (England). Nuclear Labs.
ON THE USE OF INVERSE FUNCTION AMPLIFIERS IN MEASUREMENT
B. J. Farrington Apr. 1972 22 p refs
(RD/B/M-2306) Avail: AEC Depository Libraries

The overall response of a system consisting of a sensor and an appropriate inverse function amplifier (IFA) is discussed. The analysis of such a system was performed for various degrees of mismatching of the IFA to the sensor, using an analog computer to simulate the transfer functions of the appropriate devices. It was established that the basic advantage of using an IFA system compared with a sensor alone was that the effective response time of the sensor could be greatly improved but this was offset by a corresponding degradation of signal to noise ratio. This latter property of the system limited the improvement factor in response time attainable. The results indicate that the system is only of value where response time is of prime concern, e.g. it could form the sensing device for a reactor trip system. The effect of mismatching an IFA used as part of a trip system was considered and the tolerance of the system to mismatching established for a given input profile. Author (NSA)

N73-17197# Texas Univ., Austin. Plasma Research Lab.
ION RESONANCE HEATING STUDIES
D. G. Swanson 15 Sep. 1972 27 p refs
(Contract AT(40-1)-3871)
(ORO-3871-7) Avail: NTIS

The results of several different high power RF heating experiments on the THM-2 mirror device are discussed. The first experiment discussed used a capacitor and a spark gap arrangement to provide a fast rising high power RF source designed to study heating on time scales too short for plasma energy loss mechanisms to dominate. The second group of experiments discussed used a 1-MW HF transmitter system to provide HF power and an inductive antenna to couple the energy to the plasma. The third experiment discussed involves the use of a capacitive antenna coupling structure for coupling the RF to the plasma. The transmitter system is described in an appendix. NSA

N73-17198# Helsinki Univ. of Technology, Otaniemi (Finland).
A NEW SYNTHESIS METHOD FOR BRANCH-GUIDE DIRECTIONAL COUPLERS
Martti Valtonen 1972 21 p refs
(PB-212651; APS-EI-30) Avail: NTIS HC $3.00; Finnish Academy of Technical Sciences, Lonnrotinkatu 37, 00180 Helsinki 18, Finland: Fmk 8.00 CSCL 09E

A narrow band equivalent circuit for a two port network consisting of cascaded unit length lossless transmission lines and lumped or distributed lossless shunt elements between them is obtained by replacing the shunt elements by imaginary conductances. This type of network model may successfully be used in the design of both symmetrical and asymmetrical branch guide directional couplers. The theoretical performance of the couplers at low coupling levels is in good agreement with the earlier results. An optimum termination impedance ratio giving the minimum VSWR level for fixed directivity and coupling levels is given. Author (GRA)

N73-17199# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Microwave Physics Lab.
A SIXTEEN ELEMENT SBF ARRAY Interim Report
Hermann W. Ehrenspeck and John A. Strom 23 Aug. 1972 53 p refs
(AF Proj. 4600)
(AD-751918; AFCRL-72-0500; AFCRL-PSRP-50816) Avail: NTIS CSCL 09/5

Sixteen-element short-backfire arrays have been shown to yield maximum gains of approximately 25 db. The influence of parameter variations on the array patterns and directivity has been experimentally determined by varying the frequency. A table of the normalized design parameters for an area efficiency of approximately 90 percent is given for construction purposes. All array dimensions are indicated in wavelengths so that each application can easily be scaled for any desired frequency range. Author (GRA)

N73-17200# Hughes Aircraft Co., Fullerton, Calif. Ground Systems Group.
INVESTIGATION OF NOVEL HEAT REMOVAL TECHNIQUES FOR POWER TRANSISTORS Interim Technical Report, 15 Nov. 1971 - 15 Aug. 1972
M. A. Merrigan Oct. 1972 53 p refs
(Contract DAAB07-72-C-0021; DA Proj. C81-04323-01-C8-CA)
(AD-752076; FR-72-10-1197; ECOM-0021-1) Avail: NTIS CSCL 09/1

The feasibility of new cooling methods for VHF power transistors capable of providing a reduction in junction temperature of 33% compared to conventionally packaged devices has been investigated. Design objectives for the transistors are a minimum power dissipation of 25 watts CW power from a 28-volt supply with a minimum power gain of 6 db. The electrical characteristics of the devices are to be within 10% of conventional devices, the volume no more than 4 times, and the weight no more than 5 times that of equivalent hermetically sealed devices. Achievement of these objectives was based on the application of heat pipe cooling techniques to the chip surface, within a standard TO-package. Author (GRA)

N73-17201# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
INCREASING RESOLUTION AND DECREASING DISTORTION IN TUBES
S. L. Gorelik, A. A. Gorelov, and M. G. Markovich 25 Sep. 1972 16 p refs Transl. into ENGLISH from Tekh. Kino i Televideniya (USSR), 1971 p 57-60
(AD-751879; FTD-HT-23-1269-72) Avail: NTIS CSCL 09/1

The paper deals with the aberrations which are due to the deflection of electron beams and which limit the resolving power of television systems and determine the distortion of a raster. The article discusses the problems connected with attempts to correct these aberrations and proposes a method which deals with auxiliary corrective windings for correction of these aberrations. Author (GRA)

N73-17202# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
TWENTY-ELEMENT RECEIVE ARRAY FOR THE DOPPLER ARRIVAL ANGLE SPECTRAL MEASUREMENTS EXPERIMENT. INSTRUMENTATION PAPERS
David W. Richards 15 Aug. 1972 32 p refs
(AF Proj. 414L)
(AD-751873; AFCRL-72-0475; AFCRL-IP-178) Avail: NTIS CSCL 09/5

The report describes the twenty-element receive-only antenna array to be used in the Doppler-Arrival Angle Spectral Measure-

ments experiment to be conducted at Goose Bay, Labrador, Canada. The twenty elements are configured to provide both a twelve element filled array, of spacing 10 or 20 m, and a minimum redundancy array composed of eleven elements and having equivalent aperture of 450 m. The effective beams for both types of array are described mathematically, with some reference to their well-known applications in radio astronomy. The minimum redundancy array permits greater resolution; but phase information is lost and a beam cannot be formed instantaneously, as in the case of a filled array. Author (GRA)

N73-17203# Massachusetts Univ., Amherst. Dept. of Electrical Engineering.
POWER TRANSISTOR STABILITY AND RELIABILITY Research and Development Interim Technical Report, 1 Jun. 1971 - 31 May 1972
David H. Navon Sep. 1972 113 p refs
(Contract DAAB07-71-C-0260)
(AD-751852; ECOM-0260-12) Avail: NTIS CSCL 09/1

A theoretical model was developed for the prediction of forward bias second breakdown due to lateral thermal instability in power transistors operating at low frequency. The method of analysis is to derive the steady-state current density and temperature distribution of a given transistor design under specified operating conditions and then calculate the response of the device to an internally applied temperature impulse. The current flow calculations were carried out using a distributed transistor model and a finite difference approach is used for the time-dependent heat flow problem. The effect of device design parameters such as chip thickness, base width, emitter width, base impurity concentration, etc., on the thermal stability was calculated. Also the effect on transistor stability of the current and voltage operating point, as well as heat sink temperature was analyzed. Author (GRA)

N73-17204# Varian Associates, Palo Alto, Calif.
TRANSMITTER TUBE FOR TROPOSCATTER APPLICATION Triannual Report, 25 Dec. 1971 - 24 Apr. 1972
Arthur Goldfinger Nov. 1972 32 p
(Contract DAAB07-70-C-0228; DA Proj. 1H6-62705-A-055)
(AD-752075; ECOM-0229-5) Avail: NTIS CSCL 09/1

The goal is the fabrication and delivery of a practical field transmitter with an overall efficiency of 50%; the transmitter in this case is defined as the RF power output divided by the sum of the power inputs to the klystron amplifier, the focusing mechanism and the cooling system. During the report period agreement was reached between ECOM project engineers and Varian technical personnel concerning the form of the cooling system to be used for demonstration of the transmitter. The hybrid system which combines liquid cooling the klystron body and magnet with vapor phase cooling of the klystron collector was chosen as the most practical approach. Based on this decision tube design work was completed and tube fabrication begun. One additional liquid-cooled magnetic circuit was ordered. Preliminary plans were drawn for the complete hybrid heater changer system and parts will be ordered when final details are complete. The first model of a simplified tuning mechanism was completed and preliminary tests are reported.
Author (GRA)

N73-17205# Lincoln Lab., Mass. Inst. of Tech., Lexington.
EXPERIMENTAL MEASUREMENTS OF UHF ANTENNAS NEAR AN AIR-SEA INTERFACE
Alan J. Simmons and Peter S. Kao 1 Sep. 1972 41 p refs
(Contract F19628-73-C-0002; AF Proj. 1508A)
(AD-751922; TN-1972-11; ESD-TR-72-214) Avail: NTIS CSCL 09/5

The gain and impedance of UHF slot and dipole antennas at and near the surface of simulated sea water have been measured. Measurements were carried out in a large tank whose water level with respect to the test antennas could be carefully controlled. Tests were made at a scaled frequency of 500 MHz, with a sodium chloride solution of conductivity twice that of average sea water so that the results could be applied to a frequency of 250 MHz. Results indicated that an insulated half-wave dipole floating half-submerged in the sea would have a peak gain of about 8 db below isotropic and would exhibit wide variations in gain with small changes in water level relative to the dipole center line. A half-wave slot antenna, backed by a quarter-wave rectangular cavity exhibited a peak gain of about 6 db above isotropic when flush with the water surface. Reducing the size of the cavity backing the slot reduced the gain and the efficiency of these antennas. A cylindrical cavity with a layer of insulation, with a diameter of about 0.1 wavelength (5 inches at 250 MHz) exhibited a gain near 0 dbi when floating at any level in the water (as long as not completely covered by water) and for the slot on top or bottom of the cylinder. Author (GRA)

N73-17206# Harvard Univ., Cambridge, Mass. Div. of Engineering and Applied Physics.
THREE TERM EXPONENTIAL PRODUCT SOLUTION FOR THE CURRENT ON DIPOLE ANTENNAS IN HOMOGENEOUS ISOTROPIC DATA
S. R. Mishra Jun. 1972 50 p refs
(Contract N00014-67-A-0298-0005; NR Proj. 371-016)
(AD-752474; TR-636) Avail: NTIS CSCL 09/5

Hallen's integral equation for the current on a perfectly conducting dipole immersed in an infinite, homogeneous, isotropic, dissipative medium is treated using a simplified form of the trigonometric solution. The form of the solution is an approximation to the rigorous King-Sandler-Wu (K. S. W.) solution and is more suitable from the engineering standpoint. Calculations made for electrical lengths beta H up to 3 pi/2 and for alpha/beta up to 1 are reported and are seen to agree well with the experimental results of Scott and the theoretical results predicted by the K. S. W. theory. It is expected that the theory will also be applicable to larger values of alpha/beta. Author (GRA)

N73-17207# Michigan Univ., Ann Arbor. Electron Physics Lab.
NONLINEAR PROPERTIES OF IMPATT DEVICES Ph.D. Thesis
W. E. Schroeder Oct. 1972 414 p refs
(Contract F30602-71-C-0099; AF Proj. 5573)
(AD-751974; TR-126; RADC-TR-72-267) Avail: NTIS CSCL 09/1

The purpose of the study is to investigate the nonlinear characteristics of IMPATT diodes by developing a model which occupies the middle ground between the simplified Read structure models and the very general large-scale computer simulation models. To accomplish this objective one major simplifying assumption is made: that the generation of carriers by impact ionization is localized to a region near the metallurgical junction which is relatively small compared to the total depletion width. However, the avalanche region is defined in such a manner that various realistic doping profiles and materials can be treated. Other than this assumption the carrier transport properties are kept as general as possible. The model is appropriate to the diode structures which are of the most practical importance, i.e., abrupt and hyperabrupt junctions. Author (GRA)

N73-17208# Clarkson Coll. of Technology, Potsdam, N.Y. Dept. of Electrical and Computer Engineering.
A ROBUST DETECTION SCHEME WITH FIXED THRESHOLDS FOR AMPLITUDE SHIFT KEYED SIGNALS
J. Krishnamurthy and M. Arozullah Sep. 1972 89 p refs
(Contract N00014-70-A-0311-0002)
(AD-752008; TR-72-1; NR Proj. 042-274) Avail: NTIS CSCL 09/4

A class of Robust Detection Schemes for the detection of a class of time varying signals in additive disturbance are proposed and analyzed and their performance is evaluated. The proposed detection schemes are applicable for the detection of both binary and M-ary Amplitude Shift Keyed Signals. Two detection schemes are proposed for solving the detection problem where the samples of the received signal contain pure signal components that are all unequal. These detection schemes are designated as nonparametric detection scheme and Detection Scheme with Fixed Thresholds (DSFT). The performance of these detectors is compared with that of the Least Squares Detector. It is observed that the proposed detection schemes are robust and generally lead to lower probability of error. The asymptotic relative efficiency for the detectors is shown to be greater than unity under a variety of noise conditions. The performance of the proposed detectors is immune to intersymbol interference if it is assumed that the intersymbol interference can be replaced by an unknown constant. These detectors lead to other advantages such as

being unaffected by unknown amounts of DC drifts or changes in the mean values of the noise. Author (GRA)

N73-17209# Gulf Radiation Technology, San Diego, Calif.
RADIATION-STABLE PRECISION QUARTZ OSCILLATORS Final Report
T. M. Flanagan and T. F. Wrobel 1 May 1972 81 p refs
(Contract DASA01-71-C-0151; DASA Proj. NWER-TB-056)
(AD-752584; Gulf-RT-A12089; DNA-2960F) Avail: NTIS CSCL 09/1

The objective of the research program was the radiation testing of resonators fabricated from a recently developed synthetic quartz (Premium-Q) swept with high-purity platinum electrodes. Ten resonator units from five bars were tested for both transient frequency drifts and accumulated frequency offset in a pulsed high-energy electron environment. Four resonator units from four bars were tested in a mixed neutron/gamma environment. Results are discussed. GRA

10 ELECTRONICS

Includes circuit theory; and feedback and control theory. For applications see: 09 Electronic Equipment. For related information see specific Physics categories.

N73-17210*# Chicago Univ., Ill.
[LOW LEVEL TUNING OF APPROXIMATIONS, WITH RESPONSE VARIANT EMERGING FROM STANDARDIZED HIGH LEVEL COMMANDS] Final Report
Peter H. Greene 31 Aug. 1972 37 p refs
(Grant NGR-14-001-199)
(NASA-CR-130699) Avail: NTIS HC $4.00 CSCL 09C

Both in practical engineering and in control of muscular system, low level subsystems automatically provide crude approximations to the proper response. Through low level tuning of these approximations, the proper response variant can emerge from standardized high level commands. Such systems are suited to emerging large scale integrated circuit technology. A mathematical theory was formulated, revealing significant informational units of control. A computer program was also written. Author

N73-17211*# Martin Marietta Corp., Denver, Colo.
LOW DISTORTION AUTOMATIC PHASE CONTROL CIRCUIT Patent Application
Geir Hauge and Christ W. Pederson, inventors (to NASA) Filed 5 Feb. 1973 12 p Sponsored by NASA
(NASA-Case-MFS-21671-1; US-Patent-Appl-SN-329958) Avail: NTIS HC $3.00 CSCL 09E

A voltage controlled phase shifter is described which is rendered substantially harmonic distortion free over a large dynamic input range by employing two oppositely poled, equally biased varactor diodes as the voltage controlled elements which adjust the phase shift. Control voltages which affect the bias of both diodes equally are used to adjust the phase shift without increasing distortion. A feedback stabilized phase shifter is rendered substantially frequency independent by employing a phase detector to control the phase shift of the voltage controlled phase shifter. NASA

N73-17212# Danish Research Centre for Applied Electronics, Copenhagen.
MICROCONNECTION TECHNOLOGY: ELECTRICAL CONNECTIONS FOR MINIPRINTED FILM CIRCUITS WITH MONOLITHIC COMPONENTS. SOLDERING, CONDUCTIVE EPOXY, THERMOCOMPRESSION [ELEKTRISKE FORBINDELSER TIL MINIPRINT, FILMKREDSLOB OG MONOLITISKE KOMPONENTER. LODNING, LEDENDE EPOXY, TERMOKOMPRESSION]
S. T. Olesen Sep. 1972 180 p refs In DANISH; ENGLISH summary
(ECR-27) Avail: NTIS HC $11.00

Methods for chip mounting and establishing of electrical connections in mini-printed circuits and thick-/thin-film hybrid circuits are described. Among the methods, soldering with pastes and preforms, dipsoldering, conductive epoxies, and thermocompression bonding are mentioned. A study of the materials and methods is made, and conclusions and practical rules are given, which should help the constructor in the choice of materials for a given purpose. Different examples of practical processing of bonding for different kinds of hybrid circuits and the different reliability problems in the technique are treated. Author

N73-17213# Danish Research Center for Applied Electronics, Hoersholm.
AN INVESTIGATION ON 11 PRODUCTS FROM THE 54/74 SERIES IN PLASTIC OR CERAMIC ENCAPSULATION [EN UNDERSOEGELSE AF 11 FABRIKATER FRA 54/74-SERIEN I PLAST- OG KERAMIKINDKAPSLING]
H. J. Nordby Sep. 1971 70 p refs In DANISH; ENGLISH summary
(ECR-24) Avail: NTIS HC $5.50

The characteristics of digital integrated circuits are discussed. Through the use of a relatively simple apparatus, as well as a series of environmental exposures, the quality of small scale integration circuits is determined. It is shown that various manufacturers have diverging quality levels which can be traced to several causes. Photographs of the electronic equipment tested are provided. The results of the quality control tests are shown as bar graphs. Author

N73-17214# Joint Publications Research Service, Arlington, Va.
REPORTS TO THE FIFTH ALL-UNION CONFERENCE ON CONTROL PROBLEMS
22 Jan. 1973 129 p refs Transl. into ENGLISH from Avtomat. Telemekh. (Moscow), no. 9, Sep. 1972 p 5-86 Conf. held at Moscow, Oct. 1971
(JPRS-58030) Avail: NTIS HC $8.50

The state and prospect of development of control theory for certain game problems of pursuit and evasion, optimal processes, vector Liapunov functions in feedback systems, and for probabilistic automata are considered. Author

N73-17215*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
RADIATION EFFECTS ON THREE LOW-POWER MICROCIRCUITS
K. A. Yamakawa 15 Nov. 1972 30 p refs
(Contract NAS7-100)
(NASA-CR-130750; JPL-TM-33-576) Avail: NTIS HC $3.50 CSCL 09C

Irradiation of several low power circuit elements by Co-60 gamma radiation, low and high energy electrons, and neutrons is discussed. The bipolar circuits were SE480 Q NAND gate, and a micropower frequency divider was used in electronic wrist watches. The MOS device was a dual p-channel MOSFET. Author.

N73-17216# New Mexico Univ., Albuquerque. Dept. of Electrical Engineering.
MICROELECTRONIC TECHNIQUES AND REQUIREMENTS FOR THE SPECIAL WEAPONS CENTER MICROELECTRONICS FACILITY Technical Report, 15 May 1967 - 16 Feb. 1971
Harold D. Southward and Frederick Broell, Jr. Kirtland AFB, N. Mex. AFSWC Nov. 1972 100 p refs
(Contract F29601-67-C-0057; AF Proj. 6906QN)
(AD-752216; AFSWC-TR-72-53) Avail: NTIS CSCL 09/5

The physical limitations of components used in hybrid microcircuits are reviewed. Consideration is given to effects of temperature, ionizing radiation, atomic displacement and pulsed power failure of junctions. Growth of silicon dioxide films on silicon substrates is discussed. The necessary equipment is listed and procedures for growing these films are given. Screen process printing of thick film integrated circuits is discussed, outlining all of the major steps for producing a thick film circuit. Sputtering of thin films is discussed briefly, outlining the physical differences in different types of sputtering. Facility objectives and requirements of the microelectronics facility are discussed and recommendations on equipment and personnel requirements are made. Author (GRA)

N73-17217# Maryland Univ., College Park. Dept. of Electrical Engineering.
FUNCTIONAL NETWORK THEORY AND MICROSYSTEMS

Interim Scientific Report, 1971 - 1972
Robert W. Newcomb 13 Nov. 1972 7 p
(Grant AF-AFOSR-1910-70; AF Proj. 9749)
(AD-752243; AFOSR-72-2199TR) Avail: NTIS CSCL 09/1

The report covers the third year of a research project in functional network theory and microsystems. Significant results in the design of transistor circuits, modulating tape systems, and microwave filters, in tolerance analysis, and in error correcting codes are discussed, the direction of future work in time-variable synthesis, micromotor construction, MOS structure, and subharmonic generation is indicated, and fourteen publications resulting from this research are identified. Author (GRA)

N73-17218# Braddock, Dunn and McDonald, Inc., El Paso, Tex.
NET-2 NETWORK ANALYSIS PROGRAM User's Manual
Allan F. Malmberg Sep. 1972 142 p refs
(Contract DAAG39-70-C-0050)
(AD-752600) Avail: NTIS CSCL 09/5

The report constitutes the User's Manual for the Release 8 version of the NET-2 Network Analysis Program. It supersedes the Preliminary User's Manual which was published in May 1970. The present report includes some additional circuit elements for special purpose modeling. GRA

N73-17219# Aerospace Corp., El Segundo, Calif. Lab. Operations.
PULSED-POWER BURNOUT OF INTEGRATED CIRCUITS Report for Sep. 1971 - Mar. 1972
R. H. Vandre 15 Aug. 1972 43 p
(Contract F04701-72-C-0073)
(AD-752540; TR-0073(3124)-1; SAMSO-TR-72-226) Avail: NTIS CSCL 09/5

Results of pulsed-power burnout testing of the Fairchild 9046 quad dual-input nand gate and the Amelco 6041 three-input nand gate showed the circuits to be vulnerable to junction burnout for pulses of less than 100 V and pulse widths on the order of 100 nsec. Calculations based on Wunsch-Bell junction burnout theory showed good agreement with the experimental results. Sample calculations applying Wunsch-Bell theory to integrated circuits are given. Author (GRA)

11 FACILITIES, RESEARCH AND SUPPORT

Includes airports; lunar and planetary bases including associated vehicles; ground support systems; related logistics; simulators; test facilities (e.g., rocket engine test stands, shock tubes, and wind tunnels); test ranges; and tracking stations.

N73-17220# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
THE VERTICAL MOTION AND LATERAL STABILITY OF ROAD VEHICLE TRAINS
F. D. Hales Oct. 1972 81 p refs
(TT-7211) Avail: NTIS HC $6.25

The vertical and lateral motion (separately) of road vehicle trains with an arbitrary number of components are discussed. With the exception of the tractor unit which is assumed to have two axles, the trailed components are considered to have a single axle. The object of the studies is to determine the mode shapes, natural frequency and damping for the vertical motion, and to assess the lateral stability of the lateral motion. The equations of vertical motion are derived with reference to fixed Cartesian axes, while the lateral equations of motion are obtained with reference to a set of axes rotating in yaw, located at the center of gravity of the lateral component. These two general sets of equations for n-component trains are then reduced to those for a six-component train. The sets of general equations are reduced to a single differential equation of matrix form by the process of eliminating the coupling forces and the continuity of contact at the couplings. Author

N73-17221# Systems Technology Center, Los Angeles, Calif.
STUDY OF CAPABILITIES, NECESSARY CHARACTERISTICS AND EFFECTIVENESS OF PILOT GROUND TRAINERS. VOLUME 1: MAIN TEXT Final Report, Jul. 1970 - Jun. 1971
Peter Stanek Jan. 1973 261 p refs
(Contract DOT-FA70NA-506; Proj. 502-103-10X)
(FAA-NA-72-102-Vol-1; STC-16001-Vol-1) Avail: NTIS HC $15.25

An experiment was conducted to test the capabilities, necessary characteristics, and effectiveness of pilot ground trainers in developing primary aeronautical skills, those maneuvers and procedures limited to aircraft, single-engine, land. During the first phase of the experiment, 30 subjects were trained to proficiency, fifteen in aircraft only and fifteen in combined ground trainer and aircraft. During the next phase, 20 of the original 30 were trained to proficiency, 10 in each group. A third phase of the experiment tested additional subjects in various procedures with varying levels of simulator capability. The results of the experiment show which maneuvers and procedures may be taught effectively and efficiently in a ground trainer. Author

N73-17222# Systems Technology Center, Los Angeles, Calif.
STUDY OF CAPABILITIES, NECESSARY CHARACTERISTICS AND EFFECTIVENESS OF PILOT GROUND TRAINERS. VOLUME 2: ADDENDUM, SUMMARY OF FLIGHT INSTRUCTORS VIEWS Final Report, Jul. 1970 - Jun. 1971
Peter Stanek Jan. 1973 40 p refs
(Contract DOT-FA70NA-506; Proj. 502-103-10X)
(FAA-NA-72-102-Vol-2-Add; STC-16001-Vol-2-Add) Avail: NTIS HC $4.00

For abstract see N73-17221

N73-17223*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
A STUDY ON AIRCRAFT MAP DISPLAY LOCATION AND ORIENTATION
D. Baty, T. Wempe, and E. Huff Jan. 1973 88 p refs
(NASA-TM-X-62198) Avail: NTIS HC $6.50 CSCL 14B

Six airline pilots participated in a fixed-based simulator study to determine the effects of two horizontal situation display (HSD/map) panel locations relative to the vertical situation display (VSD), and of three map orientations on manual piloting performance. Pilot comments and opinions were formally obtained. Significant performance differences were found between wind conditions and among pilots but not between map locations and orientations. The results also illustrate the potential tracking accuracy of such a display. Recommendations concerning display location and map orientation are made. Author

N73-17224*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
A SOLID CERAMIC ELECTROLYTE SYSTEM FOR MEASURING REDOX CONDITIONS IN HIGH TEMPERATURE GAS MIXING STUDIES
Richard J. Williams Dec. 1972 16 p refs
(NASA-TM-X-58105; MSC-07626) Avail: NTIS HC $3.00 CSCL 14B

The details of the construction and operation of a gas mixing furnace are presented. A solid ceramic oxygen electrolyte cell is used to monitor the oxygen fugacity in the furnace. The system consists of a standard vertical-quench, gas mixing furnace with heads designed for mounting the electrolyte cell and with facilities for inserting and removing the samples. The system also contains the high-input impedance electronics necessary for measurements and a simplified version of standard gas mixing apparatus. The calibration and maintenance of the system are discussed. Author

N73-17225# Aircraft Research Association, Ltd., Bedford (England).
CALIBRATION OF THE FLOW IN THE WORKING SECTION OF THE 12 INCH (0.35m) DIAMETER MACH 7 BLOWDOWN WIND TUNNEL
D. Morton Dec. 1972 16 p refs
(ARA-30) Avail: NTIS HC $3.00

The calibration of the flow in the working section of a hypersonic blowdown wind tunnel is discussed. The construction

of the nozzle and working section is described. The equipment used in conducting the calibration is analyzed. A diagram of the wind tunnel is provided and data obtained are shown in graph form. Author

N73-17226*# Martin Marietta Corp., Denver, Colo.
PRELIMINARY DESIGN STUDY FOR AN ATOMOSPHERIC SCIENCE FACILITY Final Report
R. Hutchison Dec. 1972 200 p refs
(Contract NAS9-12255)
(NASA-CR-128732; MCR-72-322) Avail: NTIS HC $12.00 CSCL 14B

The activities and results of the Atmospheric Science Facility preliminary design study are reported. The objectives of the study were to define the scientific goals, to determine the range of experiment types, and to develop the preliminary instrument design requirements for a reusable, general purpose, optical research facility for investigating the earth's atmosphere from a space shuttle orbital vehicle. Author

N73-17227# Brookhaven National Lab., Upton, N.Y.
MAGNETIC MEASUREMENTS OF SUPERCONDUCTING SYNCHROTRON MAGNETS
W. B. Sampson, P. F. Dahl, A. D. McInturff, and G. H. Morgan 1972 6 p refs Presented at 4th Intern. Conf. on Magnet Technol., Upton, N. Y., 19 Sep. 1972 Sponsored by AEC
(BNL-17190; Conf-720908-3) Avail: NTIS

The harmonic content of a number of superconducting iron-shielded dipoles was measured. Low field measurements were made at 60 Hz and at temperatures of 300 K, 77 K, and 4.2 K. High field measurements were made at 4.2 K for both dc and pulsed operation. Two harmonic coils were used, a long coil which includes the effects of the magnet ends, and a short coil which measures the two-dimensional field distribution. The data include the field dependence of sextupole, decapole, fourteen pole, and eighteen pole components to a maximum field of 40 kG. In addition, data are presented on the residual field (trapped field) distribution and the external or leakage field just outside the iron shield. Author (NSA)

N73-17228# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
A QUESTION OF PROCEDURE FOR EXPERIMENT IN A WIND TUNNEL
R. N. Pavlovskii 27 Oct. 1972 12 p Transl. into ENGLISH from the publ. "Teploobmenu i Massoobmenu" Kiev, Izd-vo Kiyevskogo Univ., 1969 p 456-459
(AD-751957; FTD-MT-24-603-72) Avail: NTIS CSCL 14/2

The article deals with the problem of correlating wind tunnel test data made at different times in the same tunnel or in several tunnels. The authors made 15 comparative wind tunnel tests of one wing model, in three tunnels. Graphs of the results are provided. With the use of a computer the results can be analyzed in much less time and recommended designs can be suggested on the spot. The method is suggested for use with wind tunnels in industrial enterprises. Author (GRA)

N73-17229# Naval Ordnance Lab., White Oak, Md.
DEVELOPMENT OF THE NOL THERMAL BLAST SIMULATOR
Barry S. Katz and Joseph G. Connor, Jr. 19 Jul. 1972 50 p refs
(DNA Proj. NWE-NA-007)
(AD-752023; NOLTR-72-183) Avail: NTIS CSCL 14/2

A heating method to simulate nuclear weapon thermal radiation effects was developed and combined with an existing airblast simulator, the NOL 180-foot Conical Shock Tube. Rapid heating is effected by exposing the target to hot product gases from a burning sheet of solid rocket propellant. The heat transfer process was found to be predominately convective. Fully clamped aluminum plates 9 inches square x 3/32 inch thick were exposed to propellant heating alone, airblast alone, and to propellant heating followed quickly by airblast. Results of these tests have successfully demonstrated the feasibility of simulating thermal radiation-airblast interaction effects on single targets of reasonable scale. Author (GRA)

N73-17230# Aeronautical Systems Div., Wright-Patterson AFB, Ohio.
PERFORMANCE RELATIONSHIPS OF A LINEAR SINGLE-DEGREE-OF-FREEDOM FLIGHT SIMULATOR MOTION SYSTEM DURING A SHARP ONSET ACCELERATION PROFILE
Dominick J. Gibino Mar. 1972 22 p
(AD-752222; ASD-TR-71-94) Avail: NTIS CSCL 14/2

The report examines a sharp acceleration profile representative of the cueing motions provided to crewmembers in flight simulators. A linear single-degree-of-freedom motion is assumed; the relationships among displacement, velocity limit, acceleration onset, and cue duration are determined. Design implications are inferred from the results. Author (GRA)

N73-17231# Dayton Univ. Research Inst., Ohio.
A QUARTZ LAMP BANK FOR THE CHARACTERIZATION OF THERMALLY PROTECTIVE MATERIALS Technical Report, Jan. 1971 - Feb. 1972
Nicholas J. Olson Wright-Patterson AFB, Ohio AFML Apr. 1972 48 p
(Contract F33615-69-C-1385; AF Proj. 7340)
(AD-752606; AFML-TR-72-69) Avail: NTIS CSCL 14/2

The report is an operational description of a quartz tube, tungsten filament lamp bank developed for the characterization of nonmetallic thermal protection materials for high irradiance environments. The quartz lamp bank is a highly versatile apparatus for providing irradiances of up to 60 Cal/sq cm-sec for various specimen configurations of up to 80 square inches in surface area. The three operational modes consist of: (a) a pre-set irradiance level, (b) precise regulation in a closed-loop network including a sensing radiometer, and (c) regulation over a programmed irradiance history. Air jets, a high velocity exhaust, and pressurized components are used to avoid lamp overheating and minimize contamination of critical components by pyrolysis gases emanating from irradiated materials. The quartz lamp bank has proven to be an adaptable and versatile tool in the exploratory research and development of a variety of nonmetallic thermal protection materials. The classes of characterized materials currently consist of camouflage coatings, fire protection elastomers and textiles, and protective coatings for components subject to thermonuclear irradiance. Author (GRA)

N73-17232# ARO, Inc., Arnold Air Force Station, Tenn.
HYPERVELOCITY LAUNCHER IMPROVEMENT TECHNIQUES Final Report, Jul. 1970 - Jul. 1972
J. R. DeWitt and D. T. Akers AEDC Dec. 1972 40 p refs
(Contract F40600-73-C-0004)
(AD-752554; ARO-VKF-TR-72-114; AEDC-TR-72-163) Avail: NTIS CSCL 14/2

The purpose of this work was to reduce the damage to models caused by the launching accelerations in a hypervelocity launcher. A diaphragm test device was modified to better simulate conditions at diaphragm release in a hypervelocity launcher. Modification allowed hydrogen to be used as the test gas and a sabot to be placed in a short launch tube downstream of the diaphragm. Pressure transducers on both sides of the diaphragm were used to monitor the opening characteristics of various diaphragms. It was determined that diaphragms with tapered web thicknesses could be designed to produce pressure-time histories on the base of sabots that were less conducive to production of damaging transient stress waves in the sabots. Author (GRA)

N73-17233# Army Engineer Waterways Experiment Station, Vicksburg, Miss.
EVALUATION OF HARVEY ALUMINUM 1- BY 12-FT EXTRUDED LIGHT DUTY LANDING MAT WITH SYMMETRICAL BUTT TYPE END CONNECTORS Final Report
Hugh L. Green Oct. 1972 70 p refs Sponsored in part by AFWL
(DA Proj. 1G6-64717-D-H01; AF Proj. 6111A)
(AD-752079; AEWES-Misc-Paper-S-72-38) Avail: NTIS CSCL 01/5

The investigation reported herein was conducted to evaluate an extruded aluminum alloy landing mat. The 1- by 12-ft mat is a one-piece hollow extrusion fabricated from 6063 aluminum alloy artificially aged to the T6 condition and weights 2.81 lb

per square foot of placing area. The mat panels are interlocked along the sides by means of a hinge-type connector, the components of which are integral parts of the basic extrusion. End connectors, which are composed of 6061-T6 extruded aluminum connectors with integral inserts welded to the basic panel using the electron beam welding method, consist of symmetrical butt-type sections that are secured by a locking bar after individual panels have been joined together. The investigation consisted of laboratory, traffic, and skid tests to obtain information for use in evaluating Harvey mat for potential use as a light-duty landing mat. Author (GRA)

N73-17234# Aerospace Corp., El Segundo, Calif.
EXPLOSIVE-DRIVEN EMP GENERATOR Technical Report, Jul. 1971 - Jun. 1972
Keith M. SooHoo 15 Nov. 1972 34 p refs
(Contract F04701-72-C-0073)
(AD-751907; TR-0073(3542-02)-1; SAMSO-TR-72-242) Avail: NTIS CSCL 14/2

The feasibility of radiating large quantities of energy from a satellite is discussed. A system comprised of an explosive generator source, switching and matching networks, and a bent-dipole antenna is theoretically analyzed. The calculations indicate that an electric field of 4000 V/m can be produced at a distance of 1 mile from the source. Author (GRA)

N73-17235# Massachusetts Inst. of Tech., Cambridge. Flight Transportation Lab.
THE DEVELOPMENT OF A WIND TUNNEL FACILITY FOR THE STUDY OF V/STOL NOISE
Paul Bauer and Sheila Widnall Aug. 1972 29 p refs
(Contract DAHC04-69-C-0086)
(AD-751857; FTL-R72-6; AROD-8713-2-E) Avail: NTIS CSCL 14/2

An open-jet wind tunnel operating within an anechoic chamber was developed for the purpose of the study of V/STOL noise mechanisms. An existing low-speed conventional hardwalled wind tunnel was modified to operate as an open-jet tunnel; an anechoic chamber was then constructed around the test section. The resulting aerodynamic and acoustic characteristics of the tunnel are discussed. Author (GRA)

N73-17236# Mechanical Properties Data Center, Traverse City, Mich.
[MECHANICAL PROPERTIES DATA CENTER OPERATIONAL ACTIVITIES] Annual Report, 1 Aug. 1971 - 31 Jul. 1972
Robert C. Braden Sep. 1972 34 p refs
(Contract DSA900-72-C-0787)
(AD-752499; AMMRC-CTR-72-20; AR-10) Avail: NTIS CSCL 05/2

The report describes the activities of the Mechanical Properties Data Center during the tenth year of operation. Under Contract DSA900-72-C-0787 the Center acquired 1,418 materials evaluation reports, encoded over 61,000 computer retrievable test results, responded to 182 technical inquiries and generated 15 new or revised chapters for the Aerospace Structural Metals Handbook. Emphasis on cost reimbursement through the sale of products and services by the Center necessitated a moderately aggressive marketing-sales program, a search for new users and the development of new products-services. The results of these efforts, including the attainment of nearly 60% of initial funding through sales, are discussed in detail. Hardware and data flow are described by means of a schematic flow chart. Distribution of effort, levels of activity and other statistical information are presented in graphic or tabular form. Author (GRA)

N73-17237# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AN X-RAY SOURCE FOR LASER PLASMA STUDIES
U. S. Ivanov, V. V. Ruckert, G. V. Skilizkov, and S. I. Fedotov 18 Aug. 1972 36 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz. Inst. preprint (Moscow), no. 66, 1971 p 1-35
(AF Proj. 8809; AF Proj. 3326)
(AD-752823; FTD-HT-23-454-72) Avail: NTIS CSCL 14/2

The parameters of an X-ray flash source for diagnostics of laser plasma in the temperature range from 10 to the 6th to 10 to the 8th power were calculated. The range of values of the effective wave length was chosen on the assumption that the filters used in the experiment would absorb plasma radiation and insignificantly attenuate the transmitted radiation. A field emission cathode was used as an emitter. To maximally reduce the flash duration use was made of the short-circuiting of the gap by ionized metal vapor formed upon explosion of micro-spikes on the cathode. GRA

12 FLUID MECHANICS

Includes boundary-layer flow; compressible flow; gas dynamics; hydrodynamics; and turbulence. For related information see also: 01 Aerodynamics; and 33 Thermodynamics and Combustion.

N73-17238 Hawker Siddeley Aviation, Ltd., Kingston upon Thames (England).
WAKE PROPULSION: NOTES ON THRING'S APPROACH
C. L. Bore 1 Mar. 1971 6 p ref
(RN-64) Copyright. Avail: Issuing Activity

An approach to wake propulsion (boundary layer propulsion) is presented in a mathematical analysis. An example of a two dimensional plate with a general boundary layer is used. The frames of reference velocity are defined relative to free-stream. Mass and energy fluxes are evaluated relative to a frame fixed to the vehicle. Mathematical models are developed to show the effects of drag, heating, and energy conversion. Author

N73-17239 Colorado State Univ., Fort Collins.
A COMPUTER STUDY OF WALL BOUNDARY LAYERS Ph.D. Thesis
Joshua Chukwuka Anyiwo 1971 200 p
Avail: Univ. Microfilms Order No. 72-16106

A direct solution by computer of the governing equations for the mean and fluctuating motions in incompressible, two dimensional fluid flow has been obtained using an invariant modelling technique for the triple and higher order velocity correlation terms. This provides a reasonably satisfactory data generating procedure for predicting general two dimensional wall boundary layer data for a wide variety of wall and free stream conditions, often impossible to model in wind tunnels. It has also been shown that differential methods of wall boundary layer prediction, utilizing the eddy viscosity concept, and integral relation methods, can be adapted through an implicit transition or intermittency function to provide a continuous prediction of general two dimensional wall boundary layers from laminar through transition to the turbulent regime. Dissert. Abstr.

N73-17240 Lehigh Univ., Bethlehem, Pa.
STUDY OF FREE CONVECTION WAKE ABOVE AN ISOTHERMAL VERTICAL PLATE Ph.D. Thesis
Nathan Everette Hardwick, III 1972 140 p
Avail: Univ. Microfilms Order No. 72-15882

A theoretical and experimental investigation of the steady, laminar, two dimensional wake above a thin vertical isothermal heated plate cooled by natural convection in a constant property ambient is reported. A computational procedure is developed for predicting the temperature and velocity profiles in near wake region as a function of the fluid thermal properties and the plate temperature. The system of partial differential equations governing fluid motion and heat transfer along an isothermal vertical plate and in the wake above it is formulated and solved using finite difference methods. Numerical results for this problem are obtained for a Prandtl number of 0.72 and five different values of Grashof number ranging from 1 x 100,000 to 1 x 10 to the 8th power. Dissert. Abstr.

N73-17241 Virginia Polytechnic Inst. and State Univ., Blacksburg.
NUMERICAL SOLUTIONS OF THE SUPERSONIC, LAMINAR FLOW OVER A TWO DIMENSIONAL COMPRESSION CORNER Ph.D. Thesis
James Edward Carter 1972 211 p
Avail: Univ. Microfilms Order No. 72-16287

Numerical solutions have been obtained for the supersonic, laminar flow over a two dimensional compression corner. These solutions were obtained as steady state solutions to the unsteady

Navier-Stokes equations using the finite difference method of Brailovskaya, which has second order accuracy in the spatial coordinates. Good agreement was obtained between the computed results and the wall pressure distribution measured experimentally and a Reynolds number, based on free-stream conditions and the distance from the leading edge to the corner, of 6.8 x 10,000. Dissert. Abstr.

N73-17242 Tennessee Univ., Knoxville.
DRAG ON BODIES IN RAREFIED HIGH SPEED FLOW Ph.D. Thesis
David Lawrence Whitfield 1971 131 p
Avail: Univ. Microfilms Order No. 72-15556

An analysis is presented of the drag on bodies in rarefied high-speed flow. This analysis is developed for general convex bodies at zero angle of attack and then applied specifically to spheres, cylinders, cones, and wedges. Closed-form analytical results are obtained for the drag coefficients which depend only upon the mean free path of molecules emitted from the surface of the body and some characteristic dimension. These results yield the free-molecular drag value in the limiting case of infinite mean free path and, for bluff bodies, the Newtonian drag value in the limiting case of zero mean free path. An approximate analytical solution is obtained to the integral describing the collision frequency between emitted and free-stream molecules, and comparisons with numerical solutions indicate that the approximate solution is acceptable for the flow conditions of interest. Dissert. Abstr.

N73-17243 Princeton Univ., N.J.
FINITE DIFFERENCE METHODS AND THE LEADING EDGE PROBLEM Ph.D. Thesis
Jiun-Hsiung Chen 1971 166 p
Avail: Univ. Microfilms Order No. 72-14139

Numerical solutions of finite difference approximations to the compressible Navier-Stokes equations have been calculated for the merged layer regime of the hypersonic flat plate leading edge problem. A two stream formulation of semi-kinetic approach for the slip boundary conditions has been used in the Knudsen layer adjacent to the surface of the plate. This appears to be valid even in the region near the leading edge. Similar formulations for skin friction and heat transfer have been found to be uniformly valid for the whole spectrum of flow regimes from the downstream boundary layer regime to the free molecular limit at the leading edge. Flow field results as well as surface quantities such as pressure, heat transfer, skin friction, slip velocity, and temperature jump have been obtained and compare favorably with experimental data. Dissert. Abstr.

N73-17244 Minnesota Univ., Minneapolis.
ANALYSIS OF SUPERSONIC FAR WAKE FLOW PAST TWO DIMENSIONAL AND AXISYMMETRIC POINTED BODIES USING THE METHOD OF INTEGRAL RELATIONS Ph.D. Thesis
Prabhakara Poovandur 1971 207 p
Avail: Univ. Microfilms Order No. 72-14420

The method of integral relations is extended to include the effect of nonuniform upstream flow conditions on shock shape and surface pressure distribution on two-dimensional and axisymmetric pointed bodies. The nonuniform flow field is representative of a supersonic or hypersonic far wake. An inviscid, perfect gas with flow properties varying in both longitudinal and transverse directions is considered as a far wake model. To demonstrate the application of the present method, cones and wedges are used as secondary bodies in both uniform and nonuniform flows. The cone and wedge apex angles are such that both attached and detached shock cases could be studied. A polar coordinate system, with its origin at shock-symmetry point, is chosen for the analysis. The detached shock near the origin is considered to be parabolic in shape. Dissert. Abstr.

N73-17245*# Maryland Univ., College Park. Inst. for Fluid Dynamics and Applied Mathematics.
ONE DIMENSIONAL LUNAR ASH FLOW WITH AND WITHOUT HEAT TRANSFER
S. I. Pai and T. Hsieh Nov. 1971 85 p refs
(Grants NGR-21-002-256; NGR-21-002-296; NGR-21-002-008)
(NASA-CR-130697; BN-718) Avail: NTIS HC $6.25 CSCL 20D

The characteristics of lunar ash flow are discussed in terms of the two phase flow theory of a mixture of a gas and small solid particles. A model is developed to present the fundamental equations and boundary conditions. Numerical solutions for special ash flow with and without heat transfer are presented. In the case of lunar ash flow with small initial velocity, the effect of the heat transfer makes the whole layer of ash flow more compacted together than the corresponding isothermal case. Author

N73-17246# Aeronautical Research Inst. of Sweden, Stockholm. Aerodynamics Dept.
SKIN FRICTION MEASUREMENT TECHNIQUES IN INCOMPRESSIBLE TURBULENT FLOW: A LITERATURE SURVEY Final Report
A. Bertelrud Nov. 1972 69 p refs
(FFA-AU-726) Avail: NTIS HC $3.50

A literature survey on skin friction measurement techniques for incompressible flow is presented. The best defined methods are the Preston tube, the Stanton tube and the Floating element and efforts have been concentrated upon these devices. Calibrations are usually carried out in two-dimensional flow and may be valid for moderate pressure gradients. At present, measurements on airfoils show considerable disagreement between different techniques. It is therefore necessary to compare results from different devices to get reliable quantitative information, whereas a single measurement technique can give trends. Author

N73-17247# Carleton Univ., Ottawa (Ontario). Div. of Aerothermodynamics.
AIRCRAFT TRAILING VORTICES: A SURVEY OF THE PROBLEM
Z. El-Ramly Nov. 1972 195 p refs
(ME/A-72-1) Avail: NTIS HC $11.75

A survey of aircraft trailing vortices is presented. Only vortices shed from high aspect ratio straight or sweptback wings are considered. A brief description of the formation and behavior of vortex systems is provided. The stability of a trailing vortex pair is analyzed. The effects of buoyancy on the motion of wing tip vortices and the vortex breakdown phenomenon are discussed. Author

N73-17248# Advisory Group for Aerospace Research and Development, Paris (France).
SUPERSONIC EJECTORS
J. J. Ginoux, ed. (Von Karman Inst. for Fluid Dyn.) Nov. 1972 184 p refs
(AGARDograph-163; AGARD-AG-163) Avail: NTIS HC $11.25

A state of the art review on significant progress in the design of high performance supersonic ejectors is presented. Specific summaries cover design methods for ejector systems with second throat diffusers, ejector flow models, ejector designs for various applications, and ducted mixing and burning in coaxial streams. For individual titles, see N73-17249 through N73-17253.

N73-17249 Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ONE-DIMENSIONAL INVISCID ANALYSIS OF SUPERSONIC EJECTORS
H. T. Uebelhack *In* AGARD Supersonic Ejectors Nov. 1972 p 1-16 refs (For availability see N73-17248 08-12)

The conservation equations are used to analyze the one dimensional flow patterns of supersonic ejectors. Two regimes of ejector operation, the supersonic and mixed flow, were studied. E.H.W.

N73-17250 Dornier-Werke G.m.b.H., Friedrichshafen (West Germany).
ANALYSIS AND DESIGN METHOD FOR EJECTOR SYSTEMS WITH SECOND THROAT DIFFUSERS
H. T. Uebelhack *In* AGARD Supersonic Ejectors Nov. 1972 p 17-30 refs (For availability see N73-17248 08-12)

A flow model which permits the determination of starting and operating characteristics of a second throat ejector system

is defined. Working equations are derived and design procedures described. The limits of application were discussed and compared with experiments. Author

N73-17251 Illinois Univ., Urbana. Dept. of Mechanical and Industrial Engineering.
THE ANALYSIS OF SUPERSONIC EJECTOR SYSTEMS
A. L. Addy *In* AGARD Supersonic Ejectors Nov. 1972 p 31-101 refs (For availability see N73-17248 08-12)

An analysis of the ejector flow model and its implementation is presented. Overall ejector performance characteristics were delineated on the bases of predominant flow mechanisms which occur within the various operating regimes. Data on operating characteristics, qualitative aspects of the ejector flow model, and various problem areas or projected problem areas are examined. Author

N73-17252 ARO, Inc., Arnold Air Force Station, Tenn.
EJECTOR DESIGN FOR A VARIETY OF APPLICATIONS
Delbert Taylor *In* AGARD Supersonic Ejectors Nov. 1972 p 103-163 refs (For availability see N73-17248 08-12)
(Contract F40600-69-C-0001)

Methods and techniques developed to improve the performance and applications of various ejector designs are examined. Data cover fixed value simple design and variable area/variable pressure ejectors. E.H.W.

N73-17253 ARO, Inc., Arnold Air Force Station, Tenn.
ANALYSIS OF DUCTED MIXING AND BURNING OF COAXIAL STREAMS
C. E. Peters *In* AGARD Supersonic Ejectors Nov. 1972 p 165-187 refs (For availability see N73-17248 08-12)
(Contract F40600-69-C-0001)

An extensive theoretical and experimental investigation of ducted mixing was conducted. The basic objective was to develop an adequate engineering theory to describe the ducted mixing process, including chemical reactions. Emphasis was placed on relatively long mixing systems in which the mixing layer may extend over most or all of the duct cross section at the exit plane. The duct pressure distribution will be strongly influenced by the thick mixing layers, and will be very different from the inviscid pressure distribution. Three distinct flow regimes are shown in the mixing flow. In the first regime, turbulent mixing occurs between the secondary flow and the core of inviscid primary flow. In the second regime, the inviscid core has dissipated, but a region of inviscid secondary flow exists near the duct wall. The third regime occurs after the mixing layer has spread to the wall, and the flow is entirely turbulent. Author

N73-17254# New York Univ., N.Y. AEC Computing and Applied Mathematics Center.
DISCRETE TRAVELING WAVES WHICH APPROXIMATE SHOCKS
Gray Jennings Jan. 1973 38 p refs
(Contract AT(11-1)-3077)
(COO-3077-20) Avail: NTIS HC $4.00

A numerical analysis of discrete traveling waves which approximate shocks is presented. Difference equations which approximate the single nonlinear conservation law are described. Mathematical models are developed to prove the existence of the traveling waves. Author

N73-17255# Technischen Universitaet, Munich (West Germany). Fakultaet fuer Maschinenuesen und Elektrotechnik.
THE DELAYED ADJUSTMENT OF THERMODYNAMIC EQUILIBRIUM AS BASIS OF MATHEMATICAL MODEL FOR SHOCK WAVE PROPAGATION IN TWO PHASE WATER FLOW Ph.D. Thesis [DIE VERZOEGERTE EINSTELLUNG DES THERMODYNAMISCHEN GLEICHGEWICHTS ALS GRUNDLAGE EINES RECHENMODELLS FUER DIE DRUCK-WELLENAUSBREITUNG IN DER ZWEIPHASENSTROEMUNG VON WASSER]
Klaus Koeberlein 1972 28 p refs In GERMAN
Avail: NTIS HC $3.50

A mathematical model for one-dimensional critical and sub-critical one component two-phase flow is formulated and used to simulate pronounced pressure transients and water loss including transfer from one- to two-phase coolant flow. Deviation of the water component from the thermodynamic equilibrium is expressed through mass balance separation and introduction of a mass transfer term for the compressible medium. Transl. by G.G.

N73-17256# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
AXISYMMETRIC FIELDS: APPLICATIONS TO ELECTROMAGNETISM AND TO FLUID MECHANICS
Robert Legendre Nov. 1972 42 p In FRENCH; ENGLISH summary
(ONERA-NT-207) Avail: NTIS HC $4.25

A method for describing axisymmetric fields, satisfying a Laplace equation, is proposed. It is based on the preliminary computation of elementary fields, almost devoid of physical significance but explicitly described by very simple formulas. The more classical elementary fields of sources distributed on a circle and of the circular vortex are compared to the above fields. The regular elementary fields, commonly used by physicists, are only mentioned. The new elementary fields are used for describing axisymmetric fields constrained by various boundary conditions. Author

N73-17257*# New York Univ., N.Y.
TURBULENT BOUNDARY LAYER IN AN ADVERSE PRESSURE GRADIENT WITHOUT EFFECT OF WALL CURVATURE
Victor Zakkay and Chi-Rong Wang Jan. 1973 35 p refs
(Grant NGR-33-016-181)
(NASA-CR-112247) Avail: NTIS HC $3.75 CSCL 20D

An experimental investigation of the hypersonic compressible turbulent boundary layer in an adverse pressure gradient along a cylindrical axisymmetric body was performed. The tests were conducted in a Mach 6 contoured axisymmetric nozzle. The freestream Reynolds number was 1.24 x 10 to the eighth power per meter and the wall temperature ratio was 0.634. An external compression cowl was used to produce the gradual adverse pressure gradient. A maximum pressure rise of 7 times the freestream static pressure was achieved in a test region of 23 cm. Boundary layer profiles of static pressure, total pressure, and total temperature, as well as wall transient heat transfer rates, were measured. Comparisons of the velocity total temperature profiles to linear and quadratic relations were made. Measured heat transfer data were in good agreement with the prediction from the flat-plate reference enthalpy method. Author

N73-17258*# Lockheed-California Co., Burbank.
RESEARCH ON UNSTEADY TRANSONIC FLOW THEORY
James D. Revell Feb. 1973 108 p refs
(Contract NAS1-11566)
(NASA-CR-112114) Avail: NTIS HC $7.50 CSCL 20D

A two-dimensional theory is considered for the unsteady flow disturbances caused by aeroelastic deformations of a thick wing at high subsonic freestream Mach numbers, having a single, internally embedded supercritical (locally supersonic) steady flow region adjacent to the low pressure side of the wing. The theory develops a matrix of unsteady aerodynamic influence coefficients (AICs) suitable as a strip theory for aeroelastic analysis of large aspect ratio thick wings of moderate sweep, typical of a wide class of current and future aircraft. The theory derives the linearized unsteady flow solutions separately for both the subcritical and supercritical regions. These solutions are coupled together to give the requisite (wing pressure-downwash) AICs by the intermediate step of defining flow disturbances on the sonic line, and at the shock wave; these intermediate quantities are then algebraically eliminated by expressing them in terms of the wing surface downwash. Author

N73-17259*# Scientific Translation Service, Santa Barbara, Calif.
PROBLEM OF UNIFORM JET FLOW AROUND AN AIRFOIL
E. G. Shifrin Washington NASA 22 Feb. 1973 12 p refs Transl. into ENGLISH from Izv. Akad. Nauk SSSR, Mekh. Zhidk. Gaza (USSR), Jul. - Aug. 1972 p 162-165
(Contract NASw-2483)
(NASA-TT-F-14813) Avail: NTIS HC $3.00 CSCL 20D

A uniform jet flowing around an airfoil with a separated shock wave is examined for a case of low supersonic velocities

of the incident flow where entropy changes at the shock wave may be neglected. Shapes of minimal regions of influence of the mixed flow are examined for both convex and concave profiles. Author

N73-17260*# Techtran Corp., Glen Burnie, Md.
EFFECT OF STRATIFICATION OF DENSITY ON THE MOTION OF COMPRESSIBLE FLUID IN SPHERICAL LAYERS
N. M. Astafyeva, B. S. Keller, and I. M. Yavorskaya Washington NASA Feb. 1973 31 p refs Transl. into ENGLISH from Inst. of Space Studies, Acad. of Sci., Moscow, report D-147, 1972 35 p
(Contract NASw-2485)
(NASA-TT-F-14661; D-147) Avail: NTIS HC $3.75 CSCL 20D

The axially symmetric motions of a viscous neutral stratified gas in a spherical layer, occurring as a result of rotation of the inner sphere, are investigated. Such flows are important in connection with the problem of global circulations in the atmospheres of stars and planets. The boundary problem for the system of nonlinear differential equations in partial derivatives, describing such motions, was solved numerically by the determination method. The explicit time-dependent two-layer method was used in the circulations, done with the BESM-6 computer. An approximate analytical solution was found for relatively small values of one of the dimensionless determining parameters of the problem, namely Reynolds number. Analysis of the results in comparisons of the solutions found by these methods made it possible to determine the overall pattern of flows and distribution of angular velocity in a spherical layer as functions of the Reynolds number and stratification parameter. Author

N73-17261*# South Carolina Univ., Columbia. Dept. of Aerospace Engineering.
INVESTIGATION OF MASS TRANSFER BETWEEN TWO PARALLEL WALLS AT DIFFERENT TEMPERATURES BY A MOMENT METHOD
T. N. Sloat, R. H. Edwards, and R. L. Collins Jan. 1971 149 p refs
(Grant NGL-05-018-044)
(NASA-CR-130744; USCAE-120) Avail: NTIS HC $9.50 CSCL 20D

One dimensional flow between two fixed parallel walls composed of the same substance but at different temperatures is considered. The hot plate is the evaporating surface (source) and the cold plate is the condensing surface (sink). The vapor between the two plates is assumed to be a monatomic gas consisting of Maxwell molecules. Lees' moment method is used to obtain a set of six nonlinear equations whose solution, subject to the boundary conditions of this problem, is valid from free molecular to continuum conditions. Author

N73-17262# Universite Scientifique et Medicale de Grenoble (France).
CERTAIN ASPECTS OF MOLECULAR DIFFUSION IN VORTEX FLOW: POSSIBLE APPLICATIONS TO THE ISOTOPIC SEPARATION BY FIXED WALL CENTRIFUGATION Ph.D. Thesis
Jean-Claude Guilloud 1971 276 p refs In FRENCH
(FRNC-TH-213) Avail: AEC Depository Libraries

The general equations for the molecular diffusion of a gas are presented. Some aspects of the molecular diffusion-separation in a linear gas mixture are studied. Applications to vortex flow are considered. Certain examples of secondary flow associated with the vortex flow are given which concern fixed wall centrifugation. The flow produced by a vortex filament situated along the axis of a cone and the flow in the vortex plane are studied. The existence of an exact solution for a compressible fluid is demonstrated. The experimental installation is described: vortex tube, test loop, and compressor group. Aerodynamic measurements and concentration measurements are used. The aerodynamic characteristics of the vortex tube are given. NSA

N73-17263# Commissariat a l'Energie Atomique, Grenoble (France). Centre d'Etudes Nucleaires.
LOCAL MEASUREMENTS IN TWO-PHASE FLOW
J. M. Delhaye 1972 11 p refs Presented at Intern. Conf. on Fluid Dyn. Meas. in the Ind. and Med. Environ., Leicester, England, 12-14 Apr. 1972
(CEA-CONF-2033; Conf-720456-1) Avail: AEC Depository Libraries

Different local quantities such as void fraction, liquid or gas velocities, and temperatures can be measured using anemometer techniques, electrical probes, microthermocouples, or optical sensors. These methods are described. Author (NSA)

N73-17264# Defence Research Establishment Valcartier (Quebec).
VELOCITY MAPPING OF TURBULENT WAKES OF HYPERSONIC SPHERES WITH ARRAYS OF ION PROBE PAIRS
L. Sevigny, D. Heckman, and A. Emond Aug. 1972 38 p refs
(Contract DAAH01-69-C-0921; ARPA Order 133)
(AD-751450; DREV-R-663/72) Avail: NTIS CSCL 14/2

The technique of measuring convection velocity in the hypersonic wake with a pair of in-line probes has been applied on a large scale to the mapping of the velocity field in the hypersonic wake through the use of a transverse survey array containing up to 8 ion-probe pairs. Measurements are reported of the velocity field in the wakes of 2.7 inch diameter spheres flown at 14,500 feet/second in ballistic range atmospheres at 7.6 torr and at 20 torr of nitrogen. The array technique leads to convection velocity results which are in excellent agreement with the mean wake velocity data obtained by the sequential spark technique in an air atmosphere. Author (GRA)

N73-17265# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
AN EXPERIMENTAL STUDY OF A COMPLETE EXPANSION Final Report, 1 Jan. 1970 - 1 Dec. 1971
Lawrence A. Walchli Aug. 1972 87 p refs
(AD-751983; AFFDL-TR-72-86) Avail: NTIS CSCL 20/4

The fundamental problem of a complete expansion into an evacuated tube was studied experimentally. The study consisted of two parts: the development of the expansion in the diaphragm region; and the reflection process in the region of the tube end wall. The theoretical treatment of the endwall reflection process employed a modified one-dimensional continuum theory. The isentropic expansion solution was empirically modified to include the effects of translational freezing of the gas. In addition to the endwall pressure data, sequential Schlieren photographs showed a very strong bifurcation of the normal shock wave which formed upon the arrival of the frozen tail of the expansion wave. Author (GRA)

N73-17266# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
THE INFLUENCE OF AERODYNAMIC DECELERATORS ON SUPERSONIC WAKES: WITH AN APPLICATION OF THE GaS HYDRAULIC ANALOGY Final Technical Report, Apr. 1965 - Dec. 1969
Charles A. Babish, III Aug. 1972 105 p refs
(AD-751982; AFFDL-TR-72-54) Avail: NTIS CSCL 01/3

Two-body performance characteristics can be predicted with a reasonable degree of accuracy for deployable aerodynamic decelerators operating in conventional supersonic wakes. However, under certain geometric and flight conditions, the decelerator can modify the base flow region of the forebody, thus invalidating the performance prediction techniques. A literature review, supplementary wind tunnel tests, and a large number of shallow water tow table tests were performed to obtain a description of the process of wake modification and identify those parameters that influence the process. Author (GRA)

N73-17267# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.
TYPICAL FEATURES OF TURBULENT WAKE FLOWS
R. Ermshaus 27 Apr. 1972 77 p refs Transl. into ENGLISH from Mitt. Max-Planck Inst. Stroemungsforsch. Aerodynamischen Versuchsanstalt (Gottingen), no. 46, 1970
(Contract N00017-72-C-4401)
(AD-751970; APL-CLB-3-T-650) Avail: NTIS CSCL 20/4

Plane and axisymmetric wake flows were studied experimentally in a wind tunnel. The results show that each type of

wake has its own distinct characteristics. The nature of the initial flow affects the subsequent history of the evolving flow even far downstream. The development of turbulent wakes can be represented in a formal way using certain similarity hypotheses in conjunction with the basic governing equations. An important factor is the progressive change proceeding downstream in the ratio of the turbulent friction to the square of the maximum velocity deficit. A common power law, representing the lateral growth of the wake, was found to fit the experimentally determined data for both the plane and axisymmetric wakes. Author (GRA)

N73-17268# Naval Ordnance Lab., White Oak, Md.
FLOW FIELD MEASUREMENTS AROUND AN OGIVE CYLINDER AT ANGLES OF ATTACK UP TO 15 DEGREES FOR MACH NUMBERS 3.5 AND 4
William C. Ragsdale 24 Aug. 1972 129 p refs
(WR02403001)
(AD-752025; NOLTR-72-198) Avail: NTIS CSCL 19/1

The flow field was surveyed at one station on an ogive-cylinder having a tangent ogive nose with a fineness ratio of 4. The surveys were performed with Pitot tubes and cone pressure probes at angles of attack of 0, 5, 10, and 15 degrees for Mach numbers 3.52 and 4.07. Surface static pressures were also measured. Results of the tests are presented in tabular and plotted form. Comparisons are made with inviscid flow field calculations and with experimental results from other investigations. Author

N73-17269# Naval Postgraduate School, Monterey, Calif.
HYPERSONIC LAMINAR HEAT TRANSFER
Gustave J. Hokenson Oct. 1972 28 p refs
(AD-752022; NPS-57HW72101A) Avail: NTIS CSCL 20/4

The results of an analog computer study of hypersonic laminar heat transfer including the effects of pressure gradient, mass transfer, velocity slip, Prandtl number, and wall temperature are presented. Reynolds analog factors and adiabatic wall enthalpy results are included for all combinations of the aforementioned effects. In addition, an auxiliary correlation is presented which simplifies the specification of the Reynolds analogy factor with velocity slip. All the computations were performed on the EAI 580 analog computer. Author (GRA)

N73-17270# Naval Postgraduate School, Monterey, Calif.
SMOKE AND HELIUM BUBBLE VISUALIZATION STUDIES OF INCOMPRESSIBLE FLOW PAST A JET-FLAP AIRFOIL M.S. Thesis
John Patrick Costello, II Jun. 1972 58 p refs
(AD-752012) Avail: NTIS CSCL 14/2

An exploratory low speed visualization study was performed in the wind tunnel on a jet-flapped airfoil to evaluate a test facility for future work and to compare an old and a relatively new flow visualization technique. These techniques are smoke flow and helium bubble flow. The study was conducted using various tunnel speeds and blowing rates for the jet flap. The varying of these parameters and the complexity of the jet flap flow allowed for the evaluation. As a result of many photographs taken, a comparison was made between predicted jet stream deflection and the deflections measured on photographs. Author (GRA)

N73-17271# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Fluid Dynamics Facilities Research Lab.
SHOCK DETACHMENT FROM THE LEADING EDGE OF DELTA WINGS Final Scientific Report
Kenneth F. Stetson and Norman E. Scaggs May 1972 20 p refs
(AF Proj. 7065)
(AD-752206; ARL-72-0079) Avail: NTIS CSCL 20/4

Angles of attack for shock wave detachment from the sharp leading edge of five delta wing models with flat compression surfaces were determined experimentally and the results are compared with analytical prediction methods. The wind tunnel experiments were performed at a free stream Mach number of 14.2 and a free stream Reynolds number per foot of 62,000. The angle of attack for shock wave detachment was experimentally determined by observing the flow of oil from the compression side of the model around the leading edge. Author (GRA)

N73-17272# Purdue Univ., Lafayette, Ind. Project Squid Headquarters.
ASYMPTOTIC ANALYSIS OF TURBULENT CHANNEL FLOW FOR MEAN TURBULENT ENERGY CLOSURES
Francis E. Fendell and William B. Bush Oct. 1972 36 p refs
Prepared in cooperation with TRW Systems, Redondo Beach, Calif. and Univ. of Southern Calif., Los Angeles
(Contracts N00014-67-A-0226-0005; DAHC04-67-C-0015; NR Proj. 098-038)
(AD-752462; SQUID-TR-TRW-4-PU) Avail: NTIS CSCL 20/4

The Reynolds time-averaged equations are adopted for fully turbulent two-dimensional flow of an incompressible fluid through a channel with plane smooth walls. Closure is effected by means of so-called second-order methods based on the conservation of mean turbulent kinetic energy. In particular, generalizations of the turbulent shear flow models due to Bradshaw, Ferriss, and Atwell and to Spalding and co-workers are adopted as representative of recent differential closure models. The models are treated in the limit of large turbulent Reynolds number by means of limit-process expansions. Author (GRA)

N73-17273# Rensselaer Polytechnic Inst., Troy, N.Y. Dept of Mathematics.
AN AVERAGING APPROACH TO THE THEORY OF TWO PHASE FLOWS
Lee A. Segel and Donald A. Drew (New York Univ.) 1972 24 p refs Presented at Conf. on Math. Topics in Stability Theory, Seattle, Mar. 1972
(Contract N00014-67-A-0117-0001; NR Proj. 062-190)
(AD-752159) CSCL 20/4

An approach to two-phase media is proposed and investigated. The approach is based on the application of an averaging process to the balance laws of continuum mechanics appropriately generalized to account for the interface between the phases. Principles which may be useful in a general theory of constitutive equations for two-phase media are mentioned and constitutive equations for fluid-like media are proposed. The equations of motion are applied to three situations: fluidized beds, foams, and turbulent sediment transport. Author (GRA)

N73-17274# Aerospace Research Labs., Wright-Patterson AFB, Ohio.
SHOCK IMPINGEMENT CAUSED BY BOUNDARY LAYER SEPARATION AHEAD OF BLUNT FINS
Louis G. Kaufman, II, Robert H. Korkegi, and Leo C. Morton Aug. 1972 102 p refs
(AF Proj. 7064)
(AD-752210; ARL-72-0118) Avail: NTIS CSCL 20/4

High speed flow past a blunt fin on a surface results in a fin bow shock which causes the boundary layer to separate from the surface ahead of the fin, resulting in horseshoe vortices near the surface and a lambda-type shock pattern ahead of the fin. The shock wave emanating from the separated flow region impinges on the fin bow shock and causes intense heating and high pressures locally on the fin leading edge. A research program was conducted to examine and to obtain a better understanding of these interaction flow fields, Mach three flows were surveyed ahead of blunt fins on a flat plate surface with turbulent boundary layers. Author (GRA)

N73-17275# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Applied Mathematics Research Lab.
NUMERICAL INTEGRATION OF THE EQUATIONS FOR THE STEADY INCOMPRESSIBLE BOUNDARY LAYER. DISCUSSION OF DIFFERENT APPROACHES, THEORETICAL BACKGROUND FOR A SPECIAL FORM OF GALERKIN'S METHOD Final Report
Karl G. Guderly and Chen-Chi Hsu (Ohio State Univ. Res. Found.) Sep. 1972 137 p refs
(AF Proj. 7071)
(AD-752203; ARL-72-0122) Avail: NTIS CSCL 20/4

The report discusses under a unifying point of view a number of different methods for solving the boundary layer equation. This is done by studying a model equation which has some of the features of the boundary layer equation. Inherent in the problem is the fact that all numerical approaches lead to systems of stiff difference or differential equations which must be solved numerically. Stiffness can cause numerical instability

(even though the problem itself is stable). Different methods of solving the boundary layer equation can be regarded as different ways of coping with the stiffness problem. By this analysis the authors are led to a special form of Galerkin's method for which the resulting system of ordinary differential equations has a form in which stiffness can be handled rather easily. Important for this procedure is the representation of the solution in terms of asymptotic expressions for the eigenfunctions of the operator governing the original differential equation. In the second part the application of this idea to the incompressible boundary layer equation is discussed. Author (GRA)

N73-17276# Lehigh Univ., Bethlehem, Pa. Dept. of Mechanical Engineering and Mechanics.
MEASUREMENTS OF TURBULENT VELOCITY FLUCTUATIONS IN A CONFINED JET WITH APPLICATION TO FLUID AMPLIFIER DESIGN
Robert G. Sarubbi and Satish M. Patel Jul. 1972 68 p refs
(Contract N00014-69-A-0417)
(AD-752041; THEMIS-LU-TR-13) Avail: NTIS CSCL 13/7

The effect of noise (interpreted as turbulent fluctuations of the power jet) on the design of fluid amplifiers is investigated. Mean velocity, turbulence intensity and the correlation function of velocity fluctuations between points at different separation distances at the same time have been measured. These quantities are used to calculate the root mean square values of pressure fluctuations over portions of the jet at which receivers of variable widths might be located. Author (GRA)

N73-17277# Air Force Flight Dynamics Lab., Wright-Patterson AFB, Ohio.
DIAPHRAGM RUPTURE EFFECTS ON AN EXPANDING FLOW IN A TUBE Final Report, 1 Jan. 1970 - 1 Dec. 1971
Lawrence A. Walchli Aug. 1972 67 p refs
(AD-752605; AFFDL-TR-72-62) Avail: NTIS CSCL 14/2

The fundamental problem of diaphragm rupture was studied experimentally to determine the effects on an expanding flow in an evacuated tube. Effects on the expanding flow field included general degradation of the free stream state and flow properties, establishment of shock patterns in the flow, slight source-flow effects, and turbulence from the ruptured diaphragm edges. In general, the later regions of the expanding flow became more uniform as the expansion into the evacuated tube continued. It was concluded that the use of low-shear-strength diaphragm material such as rubber-coated nylon was necessary to assure the rapid development of a shock-free flow field in an expansion to vacuum. Author (GRA)

N73-17278# Applicazioni e Ricerche Scientifiche, Milan (Italy).
MODELS FOR GAS SURFACE INTERACTIONS AND COMPUTATION OF AERODYNAMIC COEFFICIENTS Interim Scientific Report, 1 Aug. 1971 - 31 Jul. 1972
Carlo Cercignani 31 Jul. 1972 25 p refs
(Contract F44620-71-C-0121; AF Proj. 9783)
(AD-752245; AFOSR-72-2202TR) Avail: NTIS CSCL 20/4

The report is devoted to summarizing the research work carried out on models for gas surface interaction, and computation of aerodynamic coefficient for some simple geometrical shapes and high Mach number flow past thin, almost specularly reflecting airfoils. Author (GRA)

N73-17279# Naval Ordnance Lab., White Oak, Md.
DISTORTION OF NEAR-SONIC SHOCKS BY WEAKLY TURBULENT LAYERS
Leonard S. Taylor and Ralph E. Phinney 21 Sep. 1972 26 p refs
(NOL Proj. 324/FAA)
(AD-752472; NOLTR-72-225) Avail: NTIS CSCL 20/1

The focusing effects of turbulence in the propagation medium upon near-sonic shocks are studied by extending the theory of shock dynamics to a medium with random temperature and pressure variations. A perturbation procedure is used to solve the resulting nonlinear partial differential equation. The results are applied in a discussion of sonic boom distortion in the terrestrial boundary layer. Author (GRA)

N73-17280# Harry Diamond Labs., Washington, D.C.
EQUIVALENT CIRCUITS FOR FLUERIC FLIP-FLOP INPUTS
Albert I. Talkin, Gary L. Roffman, and Clarence F. Ravilious Oct. 1972 24 p refs
(DA Proj. 1T0-61102-A-33B)
(AD-752126; HDL-TR-1612) Avail: NTIS CSCL 13/7

A piecewise-linear electrical RC network equivalent of flueric flip-flops was developed, based primarily on the hysteresis loop formed by the differential control port or driving point (DP) static pressure versus flow. To complete the characterization for a particular flip-flop, two switching rise-time measurements must be made as specified in the paper. Author (GRA)

13 GEOPHYSICS

Includes aeronomy; upper and lower atmosphere studies; oceanography; cartography; and geodesy. For related information see also: 20 Meteorology; 29 Space Radiation; and 30 Space Sciences.

N73-17281 Washington Univ., Seattle.
STUDIES OF THE LIGHT SCATTERING CHARACTERISTICS OF BACKGROUND AEROSOL AND ASSOCIATED CLIMATIC IMPLICATIONS Ph.D. Thesis
William Morgan Porch 1971 113 p
Avail: Univ. Microfilms Order No. 72-15131

This study includes three basic parts: (1) the investigation of various methods of determining the background level of atmospheric aerosol light scattering; (2) the building and testing of a specially adapted, angular integrating nephelometer for measuring the component of extinction due to scattering in the angular range from 90 to 180 deg as well as from 0 to 180 deg; and (3) experiments with this instrument carefully selected to determine the relationship of the backscattering component to the total extinction, and to establish background levels of both components. The instrument is an integrating nephelometer and was used to provide information on the concentration and backscattering properties of the background aerosol of the earth's atmosphere. These experiments in turn yielded information on aerosols and the albedo of the atmosphere and its effect on the heat balance. Dissert. Abstr.

N73-17282 Minnesota Univ., Minneapolis.
THE NEUTRAL COMPOSITION OF THE POLAR THERMOSPHERE Ph.D. Thesis
David Richard Hickman 1971 158 p
Avail: Univ. Microfilms Order No. 72-14318

At 0835 CST on 4 February 1969 an Aerobee-150 rocket designated NASA 4.272 UA was launched from Ft. Churchill. This rocket contained a scientific payload of three mass spectrometers designed to measure the neutral gas composition of the atmosphere in an altitude range of 120 to 185 kilometers. In particular the data are analyzed by two methods, the first a traditional method requiring detailed information on the orientation of the rocket. The second method requires no knowledge of the rocket orientation. Number density profiles are given for helium, molecular nitrogen, atomic and molecular oxygen, and argon. All constituents were found to be nearly in diffusive equilibrium. The helium level was fairly high, supporting the winter helium bulge theory; and in contrast to all results of similar experiments over White Sands, New Mexico, helium was also found to have a gradient substantially in agreement with that required under assumptions of diffusive equilibrium. Dissert. Abstr.

N73-17283 Florida State Univ., Tallahassee.
THE DESIGN, DEVELOPMENT, AND ANALYSIS OF A MASS SPECTROMETER SYSTEM FOR NUMBER DENSITY MEASUREMENTS IN THE TERRESTRIAL THERMOSPHERE Ph.D. Thesis
Leonard Theodore Melfi 1971 160 p
Avail: Univ. Microfilm Order No. 72-13538

With the kinetic theory of a drifting Maxwellian gas it is shown that a desirable configuration for a flight experiment is a mass spectrometer mounted in a beam-forming truncated cone. It is established with model atmospheres that a rocketborne experiment to altitudes as low as 100 km is feasible using this

technique. A transparent free-stream ion source is developed and tested. The source is constructed with optically transparent mesh and is designed to be conically mounted. Energy distributions and angular distributions of the ion beam extracted from the source are given. Studies were performed with the ion source combined with a quadrupole mass spectrometer. Mass resolution as a function of ion energy is obtained, from which the effects of vehicle misalignment are estimated. It is shown for ion energies in the neighborhood of 60 eV that the mass spectrometer is insensitive to small variations in vehicle alignment and its mass resolution is satisfactory. Dissert. Abstr.

N73-17284 Cornell Univ., Ithaca, N.Y.
THEORY OF IONOSPHERIC IRREGULARITIES IN EQUATORIAL ELECTROJET PLASMA Ph.D. Thesis
Jibayo Akinrimisi 1971 140 p
Avail: Univ. Microfilms Order No. 72-13144

Theoretical studies on low-frequency electrostatic gradient-driven instabilities and their nonlinear evolution are undertaken to explain the production of ionospheric irregularities associated with the equatorial electrojet. In order to account for ionospheric irregularities of the secondary type (Type 2) instabilities which occur for electrojet velocities much less than the acoustic velocity, instabilities driven by gradients in drift velocity, ionization density, collision frequency and magnetic field have been considered. The most important instability in this respect appears to be that due to ionization density gradient, but wavelengths at marginal instability are too long to explain irregularities causing radar back-scatter at 50 MHz. The observations can be explained in terms of nonlinear transfer of energy from long wavelength linearly unstable modes to shorter wavelengths modes. Dissert. Abstr.

N73-17285 Washington Univ., Seattle.
RADIOMETEOROLOGICAL INTERPRETATIONS OF TROPOSCATTER TIME DEPENDENCE OVER A MOUNTAINOUS PATH Ph.D. Thesis
David Anthony Rogers 1971 222 p
Avail: Univ. Microfilms Order No. 72-15138

Troposcatter data has been collected on a 411-kilometer Seattle-Pullman (Washington) path using an existing beam-rotating FAA radar transmitter as the signal source. In early 1970 similar data was collected simultaneously over a Spokane-Seattle path. Long term intensity fluctuation time dependence has been studied and indicates the existence of large scale, quasi-periodic changes in the mean-square value of the index of refraction fluctuation. This result is based on a comprehensive effort in simulating the experimental intensity and log-intensity fluctuation spectra on a digital computer. Dissert. Abstr.

N73-17286*# Arizona Univ., Tucson. Dept. of Biology Sciences.
STUDY OF THE MARINE ENVIRONMENT OF THE NORTHERN GULF OF CALIFORNIA Progress Report, 21 Jun. - 31 Dec. 1972
John R. Hendrickson, Principal Investigator 20 Jan. 1973 89 p Original contains color imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21777)
(E73-10021; NASA-CR-129951) Avail: NTIS HC $6.50 CSCL 08A

There are no author-identified significant results in this report. Progress in studies of the marine environment of the northern Gulf of California is described. A ship was chartered in Mexico, staffed with local seamen, equipped for oceanographic work, and is now conducting monthly cruises of 47 stations, collecting ground observations for correlation with ERTS-1 imagery in the Arizona Regional Ecological Test Site laboratory in Tucson. Progress is reported on fabrication of instrument buoys equipped with marine-adapted DCP's to transmit ground observations via satellite to Tucson. Data handling processes are described. Coordination of work with Mexican scientists is detailed.

N73-17287*# California Univ., Berkeley. Space Sciences Lab.
AN INTEGRATED STUDY OF EARTH RESOURCES IN THE STATE OF CALIFORNIA BASED ON ERTS-1 AND SUPPORTING AIRCRAFT DATA Progress Report
Robert N. Colwell, Gene A. Thorley, Robert Burgy, Gerald Schubert, John E. Estes, Leonare W. Bowden, Vidal R. Algazi, William E. Wildman, and Gordon L. Huntington, Principal Investigators 30 Sep. 1972 160 p Original contains color imagery. Original photography may be purchased from EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21827)
(E73-10027; NASA-CR-130261) Avail: NTIS HC $10.00 CSCL 08G

There are no author-identified significant results in this report. Results of an integrated study of earth resources in the state of California using ERTS-1 and supporting aircraft data are presented. Areas of investigation cover (1) regional agricultural surveys; (2) solving water resource management problems; (3) resource management in Northern California using ERTS-1 data; (4) analysis of river meanders; (5) assessment and monitoring change in west side of the San Joaquin Valley and central coastal zone of state; (6) assessment and monitoring of changes in Southern California environment; (7) digital handling and processing of ERTS-1 data; (8) use of ERTS-1 data in educational and applied research programs of the Agricultural Extension Service; and (9) identification, classification, and mapping of salt affected soils. A.L

N73-17288*# Iowa Univ., Iowa City.
UTILIZING ERTS-A IMAGERY FOR TECTONIC ANALYSIS THROUGH STUDY OF BIG HORN MOUNTAINS REGION Progress Report, 16 Nov. 1972 - 15 Jan. 1973
Richard A. Hoppin, Principal Investigator 15 Jan. 1973 3 p
(Contract NAS5-21852)
(E73-10036; NASA-CR-129996) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. MSS scene 1085-17294 of the Big Horn region has been subjected to detailed structural analysis. Band 7 is particularly good for revealing structural and drainage patterns because of enhanced topographic detail and the subdued vegetational contrasts. Considerable stereo coverage through sidelap with adjoining scenes adds to the effectiveness of the study and has been used on both positive transparencies and enlarged prints. Negative prints of Band 7 positive transparencies have proven to be much more useful than positive prints because the higher resolution of the positive transparencies can be maintained. The Bighorn Mountains are crisscrossed by a number of prominent topographic linears, most of which can be correlated with known fault and shear zones in the Precambrian crystalline core. Many of these do not appear to continue into the flanking sedimentary rocks and a few that do (Tensleep, Tongue River lineaments) are very difficult to trace farther out into the basins. The Tongue River lineament, long a source of speculation and uncertainty as to its existence, appears as a very prominent discontinuity in the imagery.

N73-17289*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
REPETITIVE ERTS-1 OBSERVATIONS OF SURFACE WATER VARIABILITY ALONG RIVERS AND OTHER LOW LYING AREAS
Albert Rango and V. V. Salomonson [1973] 1 p Proposed for presentation at Remote Sensing of Water Resources Intern. Symp. of the Am. Water Resource Assoc., 11-14 Jun. 1973
(E73-10046; NASA-TM-X-68938) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-17290*# Wisconsin Univ., Madison.
EVALUATION OF THE APPLICATION OF ERTS-1 DATA TO THE REGIONAL LAND USE PLANNING PROCESS Progress Report, period ending 1 Feb. 1973
James L. Clapp, Principal Investigator 1 Feb. 1973 24 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21754)
(E73-10077; NASA-CR-130023) Avail: NTIS HC $3.25 CSCL 08M

There are no author-identified significant results in this report.

N73-17291*# Earth Satellite Corp., Washington, D.C.
INVESTIGATION TO IMPROVE MENHADEN FISHERY

PREDICTION Progress Report, 1 Dec. 1972 - 31 Jan. 1973
Paul M. Maughan, Principal Investigator 9 Feb. 1973 4 p
(Contract NAS5-21743)
(E73-10079; NASA-CR-130374) Avail: NTIS HC $3.00 CSCL 08A

The author has identified the following significant results. There are sufficient data to indicate that in at least one instance menhaden were found in a deepwater plume apparent from ERTS imagery. This association, discovered from an image acquired on 29 September, was retrospectively seen to have persisted for three days. Neither the prior history of the plume nor its persistence after the last day of fishing is known at this time. Some information may be forthcoming from examination of data taken by other participants in the experiment.

N73-17292*# International Business Machines Corp., Gaithersburg, Md. Federal Systems Center.
ALL DIGITAL PRECISION PROCESSING OF ERTS IMAGES Progress Report, 1 Dec. 1972 - 1 Feb. 1973
Ralph Bernstein, Principal Investigator 1 Feb. 1973 4 p
(Contract NAS5-21716)
(E73-10080; NASA-CR-130278) Avail: NTIS HC $3.00 CSCL 05B

The author has identified the following significant results. Experimentation was conducted to evaluate the performance of the Sequential Similarity Detection Algorithm (SSDA) to detect and locate ground central points (GCP) automatically using MSS data. Recent experiments with ERTS data having a temporal separation of from 17 to 72 days between the search area and the GCP have shown that the algorithm can find the GCP's and with an overall probability of 88%. Band 5 appears to give the best results. A modified reseau detection algorithm has been applied to 2 RBV scenes separated by a 12 day period. The algorithm correctly located all 486 reseaus. No false reseaus were located in a companion experiment. Changes in apparent reseau position, due to camera characteristics, were never greater than 3 picture elements in either axis. The positional error of a geometrically corrected image has been predicted by the use of an APL program. The maximum deviation of the GCP's from true UTM coordinate position was computed to be 190 meters. The RMS positional error of all GCP's was 106 meters. Further refinement of the algorithm is expected to reduce the errors.

N73-17293*# Earth Satellite Corp., Washington, D.C.
INVESTIGATION OF APPLICATION OF ERTS-A DATA TO INTEGRATED STATE PLANNING IN MARYLAND Progress Report, period ending 31 Jan. 1972
Edwin L. Thomas, Principal Investigator 2 Feb. 1973 8 p
Prepared for Md. Dept. of State Planning
(Contract NAS5-21779)
(E73-10081; NASA-CR-130279; PR-3) Avail: NTIS HC $3.00 CSCL 05C

There are no author-identified significant results in this report.

N73-17294*# Corps of Engineers, Champaign, Ill.
EFFECTS OF CONSTRUCTION AND STAGED FILLING OF RESERVOIRS ON THE ENVIRONMENT AND ECOLOGY Progress Report, 8 Dec. 1972 - 8 Feb. 1973
Ravinder K. Jain, Principal Investigator 8 Feb. 1973 1 p
(NASA Order S-70255-AG)
(E73-10082; NASA-CR-130280) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-17295*# Brevard County Planning Dept., Titusville, Fla.
URBAN AND REGIONAL PLANNING PROPOSAL NO. Y-10-066-001 Progress Report, 1 Sep. 1972 - 31 Jan. 1973
John W. Hannah and Garland L. Thomas, Principal Investigators
31 Jan. 1973 21 p
(Contract NAS5-21847)
(E73-10083; NASA-CR-130281) Avail: NTIS HC $3.25 CSCL 05K

There are no author-identified significant results in this report. A program has been completed to print out the radiance values for any specified combination of the four MSS bands for a specified sector of an image. A program to map intensities for any band is being written. An investigation of the characteristics of cities in the Brevard County area, as seen by ERTS-1, has been started. Investigation has not been completed; however, results initially obtained are presented. A Digicol viewer was used to determine the relative reflectance of cities (and other developed sectors) in the area. This was done by a combination of two methods: (1) varying the offset control so that the brightest spot appeared first, followed by the second brightest spot; and (2) reading the relative light transmissions at selected positions. A band 5 image was used and the results, in order of maximum reflectance apparent within the sector, are given. A.L.

N73-17296*# Pacific Southwest Forest and Range Experiment Station, Berkeley, Calif.
INVENTORY OF FOREST AND RANGELAND AND DETECTION OF FOREST STRESS Progress Report, 1 Jul. - 31 Dec. 1972
Robert C. Heller, Principal Investigator, Robert C. Aldrich, Frederick P. Weber, and Richard S. Driscoll 10 Jan. 1973 14 p
(NASA Order S-70251-AG)
(E73-10084; NASA-CR-130282; FS-2-1; PR-1) Avail: NTIS HC $3.00 CSCL 02F

There are no author-identified significant results in this report.

N73-17297*# Radio Corp. of America, Princeton, N.J. Astro-Electronics Div.
METEOROLOGICAL UTILITY OF HIGH RESOLUTION MULTISPECTRAL DATA Progress Report, period ending 30 Jan. 1973
John M. Danko, Principal Investigator 30 Jan. 1973 15 p
Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21741)
(E73-10085; NASA-CR-130283) Avail: NTIS HC $3.00 CSCL 04B

There are no author-identified significant results in this report. This investigation is directed towards determining the meteorological information content of ERTS-1 MSS bulk data at 0.6 - 0.7 microns as a function of resolution. To accomplish this, the resolution of the MSS data is degraded incrementally to 0.5 min. Subsequent analysis of the processed photographs in conjunction with surface and upper air observations will then determine to what extent significant meteorological information has been lost in the degradation process.

N73-17298*# Environmental Research Inst. of Michigan, Ann Arbor.
SUMMARY REPORT OF WORK ON TEN TASKS Progress Report, 1 Jul. - 31 Dec. 1972
Fred J. Thomson, Fabian C. Polcyn, L. J. Porcello, M. L. Bryan, I. J. Sattinger, W. A. Malila, R. Nalepka, C. T. Wezemak, Robert Horvath, and Robert K. Vincent, Principal Investigators Jan. 1973 50 p refs
(Contract NAS5-21783)
(E73-10086; NASA-CR-130284; Rept-193301-1-P) Avail: NTIS HC $4.50 CSCL 05B

There are no author-identified significant results in this report.

N73-17299*# Environmental Research and Technology, Inc., Lexington, Mass.
USE OF ERTS DATA FOR MAPPING SNOW COVER IN THE WESTERN UNITED STATES Progress Report, 28 Jun. - 31 Dec. 1972
James C. Barnes, Principal Investigator and Clinton J. Bowley Feb. 1973 22 p
(Contract NAS5-21803)
(E73-10087; NASA-CR-130336; P-407-3) Avail: NTIS HC $3.25 CSCL 08B

The author has identified the following significant results. Results of the analysis of the initial sample of ERTS-1 data indicate that the MSS-5 spectral band is the most useful for detecting and mapping mountain snow cover. At the ERTS-1 resolution, snow cover can be readily detected in the MSS-5 band and can be distinguished from clouds. Snow line elevations have been mapped for five mountain areas. In one case for the Salt-Verde watershed in Arizona good agreement is observed between the location of the snow line as mapped from the ERTS-1 data and as depicted on an aerial snow survey chart compiled a week earlier. Examination of data from the Arctic

has revealed that multispectral data can provide information on glacial conditions that cannot be ascertained from observations in a single spectral band.

N73-17300*# Geological Survey, McLean, Va.
INVESTIGATION OF ERTS/RBV IMAGERY FOR PHOTO-MAPPING OF THE UNITED STATES Progress Report, 1 Jul. - 31 Dec. 1972
Joseph T. Pilonero, Principal Investigator 1 Jan. 1973 4 p
(NASA Order S-70243-AG)
(E73-10088; NASA-CR-130337) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. Multispectral scanner imagery substituted for the RBV imagery appears to have surpassed initial evaluation of the anticipated image quality as compared to the expected quality of the RBV imagery. A comparison of the imagery from the two systems over the same scene will help in determining the value of each system.

N73-17301*# Geological Survey, Washington, D.C.
INVESTIGATION OF ERTS-A IMAGES FOR APPLICATION TO THEMATIC MAPPING Progress Report, 1 Jul. - 31 Dec. 1972
Dean T. Edson, Principal Investigator 1 Jan. 1973 4 p
(NASA Order S-70243-AG)
(E73-10089; NASA-CR-130338) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-17302*# Geological Survey, Washington, D.C.
LAND USE MAPPING AND MODELLING FOR THE PHOENIX QUADRANGLE Progress Report, 1 Jul. - 31 Dec. 1972
John L. Place, Principal Investigator 1 Jan. 1973 9 p
(NASA Order S-70243-AG)
(E73-10090; NASA-CR-130339) Avail: NTIS HC $3.00 CSCL 08B

The author has identified the following significant results. The land use of the Phoenix Quadrangle in Arizona had been mapped previously from aerial photographs and recorded in a computer data bank. During the ERTS experiment, changes in land use were detected, first with the ERTS-simulation photographs, then with the ERTS-1 images when they became available. In each case, the I2S color additive viewer was used as the primary image enhancement tool, operated in a multispectral mode. A search was made for a method of creating hard copy color composite images of the best combinations of multiband composites from ERTS-1, mostly by photographic and diazo processes. The I2S viewer was also used to enhance changes between successive images by quick flip techniques or by registering with different color filters. Improved interpretation of land use change resulted, and a map of changes in the Phoenix Quadrangle was compiled using magnified ERTS-1 images alone. The first level of a standard land use classification system was successfully used. Between the ERTS-1 images for August and November, some differences were detected that could be caused by seasonal characteristics of vegetation or by change in use.

N73-17303*# Geological Survey, Harrisburg, Pa.
PERFORMANCE OF THE ERTS DATA COLLECTION SYSTEM IN A TOTAL SYSTEM CONTEXT Progress Report, 1 Jul. - 31 Dec. 1972
Richard W. Paulson, Principal Investigator 26 Jan. 1973 3 p
(NASA Order S-70243-AG)
(E73-10091; NASA-CR-130340) HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-17304*# Geological Survey, Miami, Fla.
DEVELOPMENT DATA RELAY SYSTEM FOR MONITORING HYDROLOGIC CONDITIONS IN SOUTH AND CENTRAL FLORIDA Progress Report, 1 Oct. - 30 Nov. 1972
A. L. Higer, Principal Investigator 1 Dec. 1972 4 p
(NASA Order S-70243-AG-7)
(E73-10092; NASA-CR-130341) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-17305*# Geological Survey, Hartford, Conn.
ESTUARINE AND COASTAL WATER DYNAMICS CONTROLLING SEDIMENT MOVEMENT AND PLUME DEVELOPMENT IN LONG ISLAND SOUND Progress Report, 1 Jul. - 31 Dec. 1972
Frederick H. Ruggles, Jr., Principal Investigator 5 Jan. 1973 3 p
(NASA Order S-70243-AG-3)
(E73-10093; NASA-CR-130342) Avail: NTIS HC $3.00 CSCL 08C

There are no author-identified significant results in this report.

N73-17306*# Geological Survey, Tucson, Ariz.
DYNAMICS OF DISTRIBUTION AND DENSITY OF PHREATOPHYTES AND OTHER ARID LAND PLANT COMMUNITIES Progress Report, 1 Jul. - 31 Dec. 1972
Raymond M. Turner, Principal Investigator 15 Jan. 1973 5 p
(NASA Order S-70243-AG-2)
(E73-10094; NASA-CR-130343) Avail: NTIS HC $3.00 CSCL 08F

The author has identified the following significant results. Ground truth measurements of plant coverage on six satellite overflight dates reveal unique trends in coverage for the five desert or semi-desert communities selected. Densitometry and multispectral additive color viewing were used in a preliminary analysis of imagery using the electronic satellite image analyzer console at Stanford Research Institute. The densitometric analysis shows promise for mapping boundaries between plant communities. Color additive viewing of a chronologic sequence of the same scene shown in rapid order will provide a method for mapping phreatophyte communities.

N73-17307*# Bureau of Reclamation, Denver, Colo.
MONITOR WEATHER CONDITIONS FOR CLOUD SEEDING CONTROL Progress Report, 1 Jul. - 31 Dec. 1972
Archie M. Kahan, Principal Investigator 17 Jan. 1973 14 p
(NASA Order S-70243-AG-8)
(E73-10095; NASA-CR-130344) Avail: NTIS HC $3.00 CSCL 04B

There are no author-identified significant results in this report.

N73-17308*# Old Dominion Univ. Research Foundation, Norfolk, Va.
USE OF ERTS-1 TO UTILIZE AND APPLY MARINE STATION DATA TO STUDY OF PRODUCTIVITY ALONG EASTERN SHELF EXPANDED WATERS OF US Semiannual Report, 4 Aug. 1972 - 31 Jan. 1973
Harold G. Marshall, Principal Investigator and David E. Bowker 31 Jan. 1973 4 p
(Contract NAS5-21816)
(E73-10097; NASA-CR-130525) Avail: NTIS HC $3.00 CSCL 08J

There are no author-identified significant results in this report.

N73-17309*# Centre for Overseas Pest Research, London (England).
TESTING FEASIBILITY OF DETECTING POTENTIAL LOCUST BREEDING SITES Progress Report, 23 Oct. 1972 - 22 Jan. 1973
D. E. Pedgley, Principal Investigator 23 Jan. 1973 10 p
Sponsored by NASA
(E73-10098; NASA-CR-130526) Avail: NTIS HC $3.00 CSCL 06C

There are no author-identified significant results in this report.

N73-17310*# Maine Dept. of Transportation, Augusta.
TO DEVELOP A LAND USE PEAK RUNOFF CLASSIFICATION SYSTEM FOR HIGHWAY ENGINEERING PURPOSES Progress Report
Ernest G. Stoeckeler, Principal Investigator 1 Feb. 1973 2 p
(Contract NAS5-21772)
(E73-10100; NASA-CR-130528; PR-4) Avail: NTIS HC $3.00 CSCL 08B

There are no author-identified significant results in this report.

N73-17311*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
AGRICULTURE, FORESTRY, RANGE RESOURCES

W. J. Cres, Jr., Chairman and H. L. Mathews, Co-chairman 9 Mar. 1973 27 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10102; NASA-TM-X-68918) Avail: NTIS HC $3.50 CSCL 08B

Abstracts of papers given at the Symposium on Significant Results obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17312 through N73-17337.

N73-17312* Kansas Univ./Center for Research, Inc., Lawrence. Dept. of Geography and Meteorology.
IDENTIFICATION OF IRRIGATED WINTER WHEAT FROM ERTS-1 IMAGERY
Donald L. Williams, Stanley A. Morain, Bonnie Barker, and Jerry C. Coiner *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 1 (For availability see N73-17311 08-13)
(E73-10103; Paper-A1) CSCL 02C
There are no author-identified significant results in this report.

N73-17313* California Univ., Riverside. Dept. of Geography.
SEMI-AUTOMATIC CROP INVENTORY FROM SEQUENTIAL ERTS-1 IMAGERY
Claude W. Johnson and Virginia B. Coleman *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 2 (For availability see N73-17311 08-13)
(E73-10104; Paper-A2) CSCL 02C
There are no author-identified significant results in this report.

N73-17314* South Dakota State Univ., Brookings. Dept. of Plant Science.
CROP IDENTIFICATION USING ERTS IMAGERY
Maurice L. Horton and James L. Heilman *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 3 (For availability see N73-17311 08-13)
(E73-10105; Paper-A3) CSCL 02C
There are no author-identified significant results in this report.

N73-17315* Polytechnical Univ. of Madrid (Spain). Superior Technical School of Agricultural Engineering.
IDENTIFICATION OF LARGE MASSES OF CITRUS FRUIT AND RICE FIELDS IN EASTERN SPAIN
Fernando Lopez DeSagredo and Francisco G. Salinas *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 4 (For availability see N73-17311 08-13)
(E73-10106; Paper-A4) CSCL 02C
There are no author-identified significant results in this report.

N73-17316* General Electric Co., Philadelphia, Pa.
ENGINEERING ANALYSIS OF ERTS DATA FOR SOUTH-EAST ASIAN AGRICULTURE
H. L. Heydt and A. J. McNair (Cornell Univ., Ithaca, N. Y.) *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 5 Prepared in cooperation with Cornell Univ., Ithaca, N. Y. (For availability see N73-17311 08-13)
(E73-10107; Paper-A5) CSCL 02C
There are no author-identified significant results in this report.

N73-17317* Earth Satellite Corp., Berkeley, Calif.
AN INTERREGIONAL ANALYSIS OF NATURAL VEGETATION ANALOGUES USING ERTS-1 IMAGERY
Charles E. Poulton and Robin I. Welch *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 6 (For availability see N73-17311 08-13)
(E73-10108; Paper-A6) CSCL 08F
There are no author-identified significant results in this report.

N73-17318* Oregon State Univ., Corvallis.
NATURAL VEGETATION INVENTORY: AN ABSTRACT OF A PRESENTATION TO THE AGRICULTURE/FORESTRY/RANGE RESOURCES SESSION
Barry J. Schrumpf *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 7 (For availability see N73-17311 08-13)
(E73-10109; Paper-A7) CSCL 08F
There are no author-identified significant results in this report.

N73-17319* Alaska Univ., Fairbanks.
VEGETATIVE AND GEOLOGIC MAPPING OF THE WESTERN SEWARD PENINSULA, ALASKA, BASED ON ERTS-1 IMAGERY
James H. Anderson, Lewis H. Shapiro, and Albert E. Belon *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 8 (For availability see N73-17311 08-13)
(E73-10110; Paper-A8) CSCL 08F
There are no author-identified significant results in this report.

N73-17320* Nevada Univ., Reno. Renewable Resources Center.
ERTS-1 EVALUATIONS OF NATURAL RESOURCES MANAGEMENT APPLICATIONS IN THE GREAT BASIN
Paul T. Tueller *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 9 (For availability see N73-17311 08-13)
(E73-10111; Paper-A9) CSCL 08F
There are no author-identified significant results in this report.

N73-17321* Nebraska Univ., Lincoln. Dept. of Agronomy.
EVALUATION OF ERTS-1 IMAGERY IN MAPPING AND MANAGING SOIL AND RANGE RESOURCES IN THE SAND HILLS REGION OF NEBRASKA
Paul M. Seevers and James V. Drew *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 10 (For availability see N73-17311 08-13)
(E73-10112; Paper-A10) CSCL 08B
There are no author-identified significant results in this report.

N73-17322* California Univ., Berkeley. Forestry Remote Sensing Lab.
MONITORING CALIFORNIA'S FORAGE RESOURCE USING ERTS-1 AND SUPPORTING AIRCRAFT DATA
David M. Carneggie *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 11 (For availability see N73-17311 08-13)
(E73-10113; Paper-A11) CSCL 08F
There are no author-identified significant results in this report.

N73-17323* California Univ., Berkeley. Forestry Remote Sensing Lab.
TESTING THE USEFULNESS OF ERTS-1 IMAGERY FOR INVENTORYING WILDLAND RESOURCES IN NORTHERN CALIFORNIA
Donald T. Lauer and Paul F. Krumpe *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 12 (For availability see N73-17311 08-13)
(E73-10114; Paper-A12) CSCL 08F
There are no author-identified significant results in this report.

N73-17324* Centro Interamericano de Fotointerpretacion, Bogota (Colombia).
INTERPRETATION OF ERTS-MSS IMAGES OF A SAVANNA AREA IN EASTERN COLOMBIA
G. W. W. Elbersen *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 13 (For availability see N73-17311 08-13)
(E73-10115; Paper-A13) CSCL 08F
There are no author-identified significant results in this report.

N73-17325* Tennessee Univ., Knoxville.
DELINEATIONS OF MAJOR SOIL ASSOCIATIONS USING ERTS-1 IMAGERY
W. L. Parks *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 14 (For availability see N73-17311 08-13)
(E73-10116; Paper-A14) CSCL 08M
There are no author-identified significant results in this report.

N73-17326* California Univ., Riverside. Dept. of Plant Sciences.
EVALUATION OF REMOTE SENSING IN CONTROL OF PINK COTTON BOLLWORM
Virginia B. Coleman *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 15 (For availability see N73-17311 08-13)
(E73-10117; Paper-A15) CSCL 02C
There are no author-identified significant results in this report.

N73-17327* Natural Resources Management Corp., Berkeley, Calif.
DETECTION AND MONITORING OF FOREST INSECT INFESTATION IN THE SIERRA NEVADA MOUNTAINS OF CALIFORNIA
Ralph C. Hall *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 16 (For availability see N73-17311 08-13)
(E73-10118; Paper-A16) CSCL 06C
There are no author-identified significant results in this report.

N73-17328* Alaska Univ., Fairbanks.
IMPACT OF ERTS IMAGES ON SURVEYS OF FOREST INSECT INFESTATIONS IN COOK INLET BASIN, ALASKA
James H. Anderson, F. Philip Weber (Pacific Southwest Forest and Range Exp. Station), John M. Miller, Enzo Becia (Alaska Dept. of Nat. Resources), and Roy C. Beckwith (Forest Serv., Fairbanks, Alaska) *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 17 Prepared in cooperation with Pacific South West Forest and Range Exp. Station, Alaska Dept. of Nat. Resources, and Forest Serv., Fairbanks, Alaska (For availability see N73-17311 08-13)
(E73-10119; Paper-A17) CSCL 06C
There are no author-identified significant results in this report.

N73-17329* California Univ., Berkeley. Space Sciences Lab.
ERTS-1 IMAGERY AND HIGH FLIGHT PHOTOGRAPHS AS AIDS TO FIRE HAZARD APPRAISAL AT THE NASA SAN PABLO RESERVOIR TEST SITE
Robert N. Colwell *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 18 (For availability see N73-17311 08-13)
(E73-10120; Paper-A18) CSCL 02F
There are no author-identified significant results in this report.

N73-17330* Cornell Univ., Ithaca, N.Y.
PHENOLOGY SATELLITE EXPERIMENT
Bernard E. Dethier *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 19 (For availability see N73-17311 08-13)
(E73-10121; Paper-A19) CSCL 08B
There are no author-identified significant results in this report.

N73-17331* Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
VEGETATION MAPPING IN THE HOUSTON AREA WITH ERTS-1 DATA
G. R. Heath and H. D. Parker *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 20 (For availability see N73-17311 08-13)
(E73-10122; Paper-A20) CSCL 08B
There are no author-identified significant results in this report.

N73-17332* Michigan State Univ., East Lansing.
APPLICATION OF ERTS-1 DATA TO ANALYSIS OF AGRICULTURAL CROPS AND FORESTS IN MICHIGAN
Gene R. Safir, Wayne L. Myers, William A. Malila (Environ. Res. Inst. of Mich.), and James P. Morgenstern (Environ. Res. Inst. of Mich.) *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 21 Prepared in cooperation with Environ. Res. Inst. of Mich. (For availability see N73-17311 08-13)
(E73-10123; Paper-A21) CSCL 08F
There are no author-identified significant results in this report.

N73-17333* Environmental Research Inst. of Michigan, Ann Arbor.
CROP SPECIES RECOGNITION AND MENSURATION IN THE SACRAMENTO VALLEY
F. J. Thomson *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 22 (For availability see N73-17311 08-13)
(E73-10124; Paper-A22) CSCL 02C
There are no author-identified significant results in this report.

N73-17334* National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE RESULTS OF AN AGRICULTURAL ANALYSIS OF THE ERTS-1 MSS DATA AT THE MANNED SPACECRAFT CENTER.
Robert M. Bizzell, Lewis C. Wade, Harold L. Prior, and Bobby Spiers *In its* Agr., Forestry, Range Resources 9 Mar. 1973 p 23 (For availability see N73-17311 08-13)
(E73-10125; Paper-A23) CSCL 02C
There are no author-identified significant results in this report.

N73-17335* California Univ., Berkeley. Forestry Remote Sensing Lab.
AGRICULTURAL APPLICATIONS OF ERTS-1 DATA
William C. Draeger *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 24 (For availability see N73-17311 08-13)
(E73-10126; Paper-A24) CSCL 02C
There are no author-identified significant results in this report.

N73-17336* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
IDENTIFICATION OF AGRICULTURAL CROPS BY COMPUTER PROCESSING OF ERTS-MSS DATA
Marvin E. Bauer *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 25 (For availability see N73-17311 08-13)
(E73-10127; Paper-A25) CSCL 02C
There are no author-identified significant results in this report.

N73-17337* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing
IDENTIFICATION AND MAPPING OF SOILS, VEGETATION AND WATER RESOURCES BY COMPUTER ANALYSIS OF ERTS MSS DATA
M. F. Baumgardner, S. J. Kristof, and J. A. Henderson *In* NASA. Goddard Space Flight Center Agr., Forestry, Range Resources 9 Mar. 1973 p 26 (For availability see N73-17311 08-13)
(E73-10128; Paper-A26) CSCL 08B
There are no author-identified singificant results in this report.

N73-17338*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ENVIRONMENT SURVEYS
L. S. Walter, Chairman and C. C. Schnetzler, Co-chairman 9 Mar. 1973 15 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10129; NASA-TM-X-68922) Avail: NTIS HC $3.00 CSCL 08B
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17339 through N73-17352.

N73-17339* Earth Satellite Corp., Washington, D.C.
FRACTURE MAPPING AND STRIP MINE INVENTORY IN THE MIDWEST BY USING ERTS-1 IMAGERY
Charles E. Wier (Indiana Geol. Survey), Frank J. Wobber, Orville R. Russel, and Rober V. Amato *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 60 Prepared in cooperation with Indiana Geol. Survey (For availability see N73-17338 08-13)
(E73-10130; Paper-E1) CSCL 08B
There are no author-identified significant results in this report.

N73-17340* Bendix Corp., Detroit, Mich.
DETERMINE UTILITY OF ERTS-1 TO DETECT AND MONITOR AREA STRIP MINING AND RECLAMATION
Philip E. Chase and Wayne Pettyjohn (Ohio State Univ.) *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 61 Prepared in cooperation with Ohio State Univ. (For availability see N73-17338 08-13)
(E73-10131; Paper-E2) CSCL 08I
There are no author-identified significant results in this report.

N73-17341* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
THE USE OF ERTS-1 MSS DATA FOR MAPPING STRIP MINES AND ACID MINE DRAINAGE IN PENNSYLVANIA
S. S. Alexander, J. Dein, and D. P. Gold *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 62

(For availability see N73-17338 08-13)
(E73-10132; Paper-E3) CSCL 08I
There are no author-identified significant results in this report.

N73-17342* Spectral Africa (Pty) Ltd., Randfontein (Republic of South Africa).
MONITORING VEGETATION COVER ON MINE DUMPS WITH ERTS-1 IMAGERY: SOME INITIAL RESULTS
Brian Gilbertson *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 63 (For availability see N73-17338 08-13)
(E73-10133; Paper-E4) CSCL 08F
There are no author-identified significant results in this report.

N73-17343* Old Dominion Univ., Norfolk, Va.
REMOTE DETECTION OF AEROSOL POLLUTION BY ERTS
G. E. Copeland, A. R. Bandy, Earl C. Kindle, and Gary Hilton *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 64 (For availability see N73-17338 08-13)
(E73-10134; Paper-E5) CSCL 04B
There are no author-identified significant results in this report.

N73-17344* Forest Management Inst., Ottawa (Ontario). Canadian Forestry Service.
DETECTION, MAPPING AND ESTIMATION OF RATE OF SPREAD OF GRASS FIRES FROM SOUTHERN AFRICAN ERTS-1 IMAGERY
J. M. Wightman *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 65 (For availability see N73-17338 08-13)
(E73-10135; Paper-E6) CSCL 08B
There are no author-identified significant results in this report.

N73-17345* American Univ., Washington, D.C. Biology Dept.
ATLANTIC COASTAL WETLANDS MAPPING (MARYLAND, GEORGIA) USING ERTS-1 IMAGERY
Richard R. Anderson, Virginia Carter, and John McGinness *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 66 (For availability see N73-17338 08-13)
(E73-10136; Paper-E7) CSCL 08B
There are no author-identified significant results in this report.

N73-17346* Delaware Univ., Newark. College of Marine Studies.
IDENTIFICATION OF COASTAL VEGETATION SPECIES IN ERTS-1 IMAGERY
V. Klemas and D. Bartlett *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 67 (For availability see N73-17338 08-13)
(E73-10137; Paper-E8) CSCL 08F
There are no author-identified significant results in this report.

N73-17347* Earth Satellite Corp., Washington, D.C.
APPLICATION OF ERTS-1 DATA TO THE PROTECTION AND MANAGEMENT OF NEW JERSEY'S COASTAL ENVIRONMENT
Robert L. Mairs, Frank J. Wobber, Donald Garofalo, and Roland Yunghans (N. J. Dept. of Environ. Protection) *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 68 Prepared in cooperation with N. J. Dept. of Environ. Protection (For availability see N73-17338 08-13)
(E73-10138; Paper-E9) CSCL 08H
There are no author-identified significant results in this report.

N73-17348* Environmental Research Inst. of Michigan, Ann Arbor.
MONITORING OCEAN DUMPING WITH ERTS-1 DATA
C. T. Wezernak and N. Roller *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 69 (For availability see N73-17338 08-13)
(E73-10139; Paper-E10) CSCL 08J
There are no author-identified significant results in this report.

N73-17349* Vermont Univ., Burlington.
ENVIRONMENTAL STUDY OF ERTS-1 IMAGERY: LAKE CHAMPLAIN AND VERMONT
A. O. Lind, E. B. Henson, and J. O. Pelton *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 70 (For availability see N73-17338 08-13)
(E73-10140; Paper-E11) CSCL 08F
There are no author-identified significant results in this report.

N73-17350* Kansas Univ., Lawrence.
WATER TURBIDITY DETECTION USING ERTS-1 IMAGERY
H. L. Yarger and J. R. McCauley *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 71 (For availability see N73-17338 08-13)
(E73-10141; Paper-E12) CSCL 08J
There are no author-identified significant results in this report.

N73-17351* American Univ., Washington, D.C. Biology Dept.
DIGITAL ANALYSIS OF POTOMAC RIVER BASIN ERTS IMAGERY: SEDIMENTATION LEVELS AT THE POTOMAC-ANACOSTIA CONFLUENCE AND STRIP MINING IN ALLEGHENY COUNTY, MARYLAND
J. S. Schubert and N. H. MacLeod *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 72 (For availability see N73-17338 08-13)
(E73-10142; Paper-E13) CSCL 08J
There are no author-identified significant results in this report.

N73-17352* Tokyo Univ. (Japan). Inst. of Industrial Science.
PRESENT STATUS OF REMOTE SENSING WITH ERTS IMAGE IN JAPAN
Maruyasu Takakazu and Tsuchiya Kiyoshi *In* NASA. Goddard Space Flight Center Environment Surveys 9 Mar. 1973 p 73 (For availability see N73-17338 08-13)
(E73-10143; Paper-E14) CSCL 08F
There are no author-identified significant results in this report.

N73-17353*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL RESOURCES, GEOLOGICAL STRUCTURE AND LANDFORM SURVEYS
M. N. Short, Chairman and P. D. Lowman, Co-chairman 9 Mar. 1973 34 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10144; NASA-TM-X-68923) Avail: NTIS HC $3.75 CSCL 08G

Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17354 through N73-17386.

N73-17354* New York State Museum and Science Service, Albany.
EVALUATION OF ERTS-1 IMAGERY FOR GEOLOGICAL SENSING OVER THE DIVERSE GEOLOGICAL TERRANES OF NEW YORK STATE
Yngvar W. Isachsen, Robert H. Fakundinx, and Stephen W. Forster *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 27 (For availability see N73-17353 08-13)
(E73-10145; Paper-G1) CSCL 08G
There are no author-identified significant results in this report.

N73-17355* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
ANALYSIS AND APPLICATION OF ERTS-1 DATA FOR REGIONAL GEOLOGIC MAPPING
D. P. Gold, S. S. Alexander, and R. R. Parizek *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 28 (For availability see N73-17353 08-13)
(E73-10146; Paper-G2) CSCL 08G
There are no author-identified significant results in this report.

N73-17356* Utah Univ., Salt Lake City. Dept. of Geology and Geophysical Science.
GEOLOGY OF UTAH AND NEVADA BY ERTS-1 IMAGERY
Mead L. Jensen *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 29 (For availability see N73-17353 08-13)
(E73-10147; Paper-G3) CSCL 08G
There are no author-identified significant results in this report.

N73-17357* Geological Survey, Menlo Park, Calif.
PRELIMINARY GEOLOGIC APPLICATION OF ERTS-1 IMAGERY IN ALASKA
Ernest H. Lathram, I. L. Tailleur, W. W. Patton, Jr., and W. A. Fischer (Geol. Surv. Washington, D. C.) *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 30 (For availability see N73-17353 08-13)
(E73-10148; Paper-G4) CSCL 08G
There are no author-identified significant results in this report.

N73-17358* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A COMPARISON OF GEMINI AND ERTS IMAGERY OBTAINED OVER SOUTHERN MOROCCO
Herbert W. Blodget and Arthur T. Anderson *In its* Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 31 (For availability see N73-17353 08-13)
(E73-10149; Paper-G5) CSCL 08G
There are no author-identified significant results in this report.

N73-17359* Bureau de Recherches Geologiques et Minieres, Orleans (France).
CAPABILITY OF ERTS-1 IMAGERY TO INVESTIGATE GEOLOGICAL AND STRUCTURAL FEATURES IN A SEDIMENTARY BASIN (BASSIN PARISIEN, FRANCE)
Claude Cavelier, Jean-Yves Scanvic, Guy Weecksteen, and Alain Ziserman *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 32 (For availability see N73-17353 08-13)
(E73-10150; Paper-G6) CSCL 08G
There are no author-identified significant results in this report.

N73-17360* Geological Survey, Denver, Colo.
APPLICATION OF ERTS-1 MULTISPECTRAL IMAGERY TO MONITORING THE PRESENT EPISODE OF ACCELERATED EROSION IN SOUTHERN ARIZONA
Roger B. Morrison *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 33 (For availability see N73-17353 08-13)
(E73-10151; Paper-G7) CSCL 08M
There are no author-identified significant results in this report.

N73-17361* Geological Survey, Denver, Colo.
A STUDY OF MORPHOLOGY, PROVENANCE, AND MOVEMENT OF DESERT SAND SEAS IN AFRICA, ASIA, AND AUSTRALIA
Edwin D. McKee *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 34 (For availability see N73-17353 08-13)
(E73-10152; Paper-G8) CSCL 08M
There are no author-identified significant results in this report.

N73-17362* National Center for Earthquake Research, Menlo Park, Calif.
ESTABLISHMENT, TEST, AND EVALUATION OF A PROTOTYPE VOLCANO SURVEILLANCE SYSTEM
Peter L. Ward, Jerry P. Easton, Elliot Endo, David Harlow, Daniel Marquez, and Rex Allen *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 35 (For availability see N73-17353 08-13)
(E73-10153; Paper-G9) CSCL 08E
There are no author-identified significant results in this report.

N73-17363* Geological Survey, Washington, D.C. EROS Program Office.
SATELLITE GEOLOGICAL AND GEOPHYSICAL REMOTE SENSING OF ICELAND: PRELIMINARY RESULTS FROM ANALYSIS OF MSS IMAGERY
Richard S. Williams, Jr. *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 36 (For availability see N73-17353 08-13)
(E73-10154; Paper-G10) CSCL 08G
There are no author-identified significant results in this report.

N73-17364* Canadian Center for Remote Sensing, Ottawa (Ontario).
PRELIMINARY ASSESSMENT OF GEOLOGICAL APPLICATIONS OF ERTS-1 IMAGERY FOR SELECTED AREAS IN THE CANADIAN ARCTIC
Alan F. Gregory *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 37 (For availability see N73-17353 08-13)
(E73-10155; Paper-G11) CSCL 08G
There are no author-identified significant results in this report.

N73-17365* Earth Satellite Corp., Washington, D.C.
EXPLOITATION OF ERTS-1 IMAGERY UTILIZING SNOW ENHANCEMENT TECHNIQUES
Frank J. Wobber and Kenneth R. Martin *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 38 (For availability see N73-17353 08-13)
(E73-10156; Paper-G12) CSCL 08L
There are no author-identified significant results in this report.

N73-17366* Geological Survey, Denver, Colo.
MAPPING QUATERNARY LANDFORMS AND DEPOSITS IN THE MIDWEST AND GREAT PLAINS BY MEANS OF ERTS-1 MULTISPECTRAL IMAGERY
Roger B. Morrison *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 39 (For availability see N73-17353 08-13)
(E73-10157; Paper-G13) CSCL 08B
There are no author-identified significant results in this report.

N73-17367* Wyoming Univ., Laramie. Dept. of Geology.
GLACIATION IN NORTHWEST WYOMING AS INTERPRETED FROM ERTS-1
Roy M. Breckenridge *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 40 (For availability see N73-17353 08-13)
(E73-10158; Paper-G14) CSCL 08E
There are no author-identified significant results in this report.

N73-17368* Mississippi Geological Survey and Water Resources, Rolla.
FIRST LOOK ANALYSIS OF GEOLOGIC GROUND PATTERNS ON ERTS-1 IMAGERY OF MISSOURI
William H. Allen and James A. Martin *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 41 (For availability see N73-17353 08-13)
(E73-10159; Paper-G15) CSCL 08G
There are no author-identified significant results in this report.

N73-17369* Environmental Research Inst. of Michigan, Ann Arbor.
RATIO MAPS OF IRON ORE DEPOSITS, ATLANTIC CITY DISTRICT, WYOMING
Robert K. Vincent *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 42 (For availability see N73-17353 08-13)
(E73-10160; Paper-G16) CSCL 08B
There are no author-identified significant results in this report.

N73-17370* Geological Survey, Washington, D.C.
USE OF ERTS-1 IMAGES IN THE SEARCH FOR PORPHYRY COPPER DEPOSITS IN PAKISTANI BALUCHISTAN
Robert G. Schmidt *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 43 (For availability see N73-17353 08-13)
(E73-10161; Paper-G17) CSCL 08G
There are no author-identified significant results in this report.

N73-17371* Stanford Univ., Calif. School of Earth Sciences.
RELATION OF ERTS-1 DETECTED GEOLOGIC STRUCTURE TO ORE AND MINERAL FUEL DEPOSITS, NORTHERN COAST RANGES, CALIFORNIA
Ernest I. Rich *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 44 (For availability see N73-17353 08-13)
(E73-10162; Paper-G18) CSCL 08G
There are no author-identified significant results in this report.

N73-17372* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
PRELIMINARY GEOLOGIC INVESTIGATIONS IN THE COLORADO PLATEAU USING ENHANCED ERTS IMAGES
Alexander F. H. Goetz, Fred C. Billingsley, Donald P. Elston (Geol. Surv., Flagstaff, Ariz.), Ivo Lucchitta (Geol. Surv., Flagstaff, Ariz.), and Eugene M. Shoemaker (Calif. Inst. of Tech., Pasadena) *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 45 Prepared in cooperation with Geol. Surv., Flagstaff, Ariz. and Calif. Inst. of Tech., Pasadena (For availability see N73-17353 08-13)
(E73-10163; Paper-G19) CSCL 08G
There are no author-identified significant results in this report.

N73-17373* Geological Survey, Washington, D.C.
STRUCTURAL GEOLOGIC AND RADIOMETRIC ANALYSIS OF ERTS-1 IMAGES OF NEVADA AND SOUTHERN CALIFORNIA: A PRELIMINARY REPORT
Lawrence C. Rowan and Pamela H. Wetlaufer *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 46 (For availability see N73-17353 08-13)
(E73-10164; Paper-G20) CSCL 08G
There are no author-identified significant results in this report.

N73-17374* Argus Exploration Co., Newport Beach, Calif.
REGIONAL TECTONIC CONTROL OF TERTIARY MINERALIZATION AND RECENT FAULTING IN THE SOUTHERN BASIN-RANGE PROVINCE (AN APPLICATION OF ERTS-1 DATA)
I. C. Bechtold, M. A. Liggett, and J. F. Childs *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 47 (For availability see N73-17353 08-13)
(E73-10165; Paper-G21) CSCL 08F
There are no author-identified significant results in this report.

N73-17375* North American Rockwell Corp., Thousand Oaks, Calif. Science Center.
ERTS APPLICATIONS IN EARTHQUAKE RESEARCH AND MINERAL EXPLORATION IN CALIFORNIA
Monem Abdel-Gawad and Joel Silverstein *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 48 (For availability see N73-17353 08-13)
(E73-10166; Paper-G22) CSCL 08K
There are no author-identified significant results in this report.

N73-17376* Alaska Univ., Fairbanks. Geophysical Inst.
SOME ASPECTS OF REGIONAL TECTONICS IN ALASKA AS SEEN IN ERTS-1 IMAGERY
Larry Gedney *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 49 (For availability see N73-17353 08-13)
(E73-10167; Paper-G23) CSCL 08G
There are no author-identified significant results in this report.

N73-17377* Geological Survey, Washington, D.C.
ERTS-1 IMAGE CONTRIBUTES TO UNDERSTANDING OF GEOLOGIC STRUCTURES RELATED TO MANAGUA EARTHQUAKE, 1972
W. D. Carter and G. P. Eaton *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 50 (For availability see N73-17353 08-13)
(E73-10168; Paper-G24) CSCL 08G
There are no author-identified significant results in this report.

N73-17378* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
RECOGNITION OF SURFACE LITHOLOGIC AND TOPOGRAPHIC PATTERNS IN SOUTHWEST COLORADO WITH ADP TECHNIQUES
W. N. Melhorn and S. Sinnock *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 51 (For availability see N73-17353 08-13)
(E73-10169; Paper-G25) CSCL 08F
There are no author-identified significant results in this report.

N73-17379* Johannesburg Consolidated Investment Co. Ltd., Randfontein (Republic of South Africa). Geological Research Dept.
ERTS-1 IMAGERY AS AN AID TO THE DEFINITION OF THE GEOTECTONIC DOMAINS OF THE SOUTHERN AFRICAN CRYSTALLINE SHIELD
Morris J. Viljoen *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 52 (For availability see N73-17353 08-13)
(E73-10170; Paper-G26) CSCL 08G
There are no author-identified significant results in this report.

N73-17380* Technischen Universitaet, Munich (West Germany).
NEW ASPECTS ON THE TECTONIC OF THE ALPS AND THE APENNINES REVEALED BY ERTS-1 DATA
J. Bodechtel *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 53 (For availability see N73-17353 08-13)
(E73-10171; Paper-G27) CSCL 08G
There are no author-identified significant results in this report.

N73-17381* Canadian Center for Remote Sensing, Ottawa (Ontario).
STRUCTURAL LINEAMENTS OF GASPE FROM ERTS IMAGERY
R. Steffensen *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 54 (For availability see N73-17353 08-13)
(E73-10172; Paper-G28) CSCL 08F
There are no author-identified significant results in this report.

N73-17382* Geological Survey, Washington, D.C.
LINEAMENTS IN COASTAL PLAIN SEDIMENTS AS SEEN IN ERTS IMAGERY
Charles F. Withington *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 55 (For availability see N73-17353 08-13)
(E73-10173; Paper-G29) CSCL 08H
There are no author-identified significant results in this report.

N73-17383* Texas Instruments, Inc., Dallas.
EVALUATION OF COMMERICAL UTILITY OF ERTS-A IMAGERY IN STRUCTURAL RECONNAISSANCE FOR MINERALS AND PETROLEUM
Donald F. Saunders and Gilbert E. Thomas *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 56 (For availability see N73-17353 08-13)
(E73-10174; Paper-G30) CSCL 08G
There are no author-identified significant results in this report.

N73-17384* Iowa Univ., Iowa City. Dept. of Geology.
STRUCTURAL INTERPRETATIONS BASED ON ERTS-1 IMAGERY, BIGHORN REGION, WYOMING-MONTANA
Richard A. Hoppin *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 57 (For availability see N73-17353 08-13)
(E73-10175; Paper-G31) CSCL 08F
There are no author-identified significant results in this report.

N73-17385* Montana Univ., Missoula.
APPLICABILITY OF ERTS-1 TO LINEAMENT AND PHOTOGEOLOGIC MAPPING IN MONTANA: PRELIMINARY REPORT
Robert M. Weidman, David D. Alt, Richard B. Berg (Mont. Bur. of Mines and Geol.), Willis M. Johns (Mont. Bur. of Mines and Geol.), Raymond E. Flood, Jr., Katharine T. Hawley, and Linda K. Wackwitz *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and Landform Surv. 9 Mar. 1973 p 58 Prepared in cooperation with Mont. Bur. of Mines and Geol. (For availability see N73-17353 08-13)
(E73-10176; Paper-G32) CSCL 08G
There are no author-identified significant results in this report.

N73-17386* California Univ., Riverside. Dept. of Geography.
NEW FAULT LINEAMENT IN SOUTHERN CALIFORNIA
Robert W. Pease and Claude W. Johnson *In* NASA. Goddard Space Flight Center Mineral Resources, Geol. Struct. and

Landform Surv. 9 Mar. 1973 p 59 (For availability see N73-17353 08-13)
(E73-10177; Paper-G33) CSCL 08F
There are no author-identified significant results in this report.

N73-17387*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPRETATION TECHNIQUES DEVELOPMENT
W. Alford, Chairman 9 Mar. 1973 20 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10178; NASA-TM-X-68924) Avail: NTIS HC $3.00 CSCL 08B
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17388 through N73-17406.

N73-17388* Environmental Research Inst. of Michigan, Ann Arbor.
ATMOSPHERIC EFFECTS IN ERTS-1 DATA, AND ADVANCED INFORMATION EXTRACTION TECHNIQUES
William A. Malila and Richard F. Nalepka *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 121 (For availability see N73-17387 08-13)
(E73-10179; Paper-I1) CSCL 04A
There are no author-identified significant results in this report.

N73-17389* Science Applications, Inc., La Jolla, Calif.
DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE
M. Griggs *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 122 (For availability see N73-17387 08-13)
(E73-10180; Paper-I2) CSCL 04A
There are no author-identified significant results in this report.

N73-17390* Bendix Corp., Ann Arbor, Mich. Aerospace Systems Div.
A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS
Robert H. Rogers and Keith Peacock *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 123 (For availability see N73-17387 08-13)
(E73-10181; Paper-I3) CSCL 04A
There are no author-identified significant results in this report.

N73-17391* International Imaging Systems, Mountain View, Calif.
MASKING BULK RBV IMAGES TO REDUCE STATIONARY RESIDUAL ERRORS IN RADIOMETRIC CORRECTION
D. S. Ross *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 124 (For availability see N73-17387 08-13)
(E73-10182; Paper-I4) CSCL 05B
There are no author-identified significant results in this report.

N73-17392* Geological Survey, McLean, Va.
GEOMETRIC QUALITY OF ERTS-1 IMAGES
Robert B. McEwen *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 125 (For availability see N73-17387 08-13)
(E73-10183; Paper-I5) CSCL 05B
There are no author-identified significant results in this report.

N73-17393* TRW Systems Group, Redondo Beach, Calif.
DIGITAL RECTIFICATION OF ERTS MULTISPECTRAL IMAGERY
Samuel S. Rifman *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 126 (For availability see N73-17387 08-13)
(E73-10184; Paper-I6) CSCL 05B
There are no author-identified significant results in this report.

N73-17394* International Business Machines Corp., Gaithersburg, Md. Federal Systems Div.
RESULTS OF PRECISION PROCESSING (SCENE CORRECTION) OF ERTS-1 IMAGES USING DIGITAL IMAGE PROCESSING TECHNIQUES
Ralph Bernstein *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 127 (For availability see N73-17387 08-13)
(E73-10185; Paper-I7) CSCL 14E
There are no author-identified significant results in this report.

N73-17395* Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
SIGNIFICANT TECHNIQUES FOR THE PROCESSING AND INTERPRETATION OF ERTS-1 DATA
S. B. Cousin, J. F. Paris, J. F. Potter, and A. C. Anderson *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 128 (For availability see N73-17387 08-13)
(E73-10186; Paper-I8) CSCL 05B
There are no author-identified significant results in this report.

N73-17396* Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
COMPUTER TECHNIQUES USED FOR SOME ENHANCEMENTS OF ERTS IMAGES
F. C. Billingsley and A. F. H. Goetz *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1972 p 129 (For availability see N73-17387 08-13)
(E73-10187; Paper-I9) CSCL 09B
There are no author-identified significant results in this report.

N73-17397* California Univ., Davis. Dept. of Electrical Engineering.
DIGITAL ENHANCEMENT OF MULTISPECTRAL MSS DATA FOR MAXIMUM IMAGE VISIBILITY
V. Ralph Algazi *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 130 (For availability see N73-17387 08-13)
(E73-10188; Paper-I10) CSCL 09B
There are no author-identified significant results in this report.

N73-17398* California Univ., Riverside. Dept. of Geography.
ERTS-1 IMAGE ENHANCEMENT BY OPTICALLY COMBINING DENSITY SLICES
Gerald O. Tapper and Robert W. Pease *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 131 (For availability see N73-17387 08-13)
(E73-10189; Paper-I11) CSCL 14E
There are no author-identified significant results in this report.

N73-17399* RAND Corp., Santa Monica, Calif.
PSEUDOCOLOR TRANSFORMATION OF ERTS IMAGERY
Jeannine Lamar and Paul M. Merifield (Earth Sci. Res. Corp.) *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 132 Prepared in cooperation with Earth Sci. Res. Corp. (For availability see N73-17387 08-13)
(E73-10190; Paper-I12) CSCL 14E
There are no author-identified significant results in this report.

N73-17400* Bolt, Beranek, and Newman, Inc., Cambridge, Mass.
DIGITAL INTERACTIVE IMAGE ANALYSIS BY ARRAY PROCESSING
Bruno E. Sabels (Geocom, Inc.), Jerry D. Jennings (Geocom, Inc.), and Ronald E. Hubert *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 133 (For availability see N73-17387 08-13)
(E73-10191; Paper-I13) CSCL 14E
There are no author-identified significant results in this report.

N73-17401* California Univ., Berkeley. Forestry Remote Sensing Lab.
COMBINING HUMAN AND COMPUTER INTERPRETATION CAPABILITIES TO ANALYZE ERTS IMAGERY
J. D. Nichols *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 134 (For availability see N73-17387 08-13)
(E73-10192; Paper-I14) CSCL 05B
There are no author-identified significant results in this report.

N73-17402* Stanford Research Inst., Menlo Park, Calif. Atmospheric Sciences Lab.
ANALYSIS OF ERTS IMAGERY USING SPECIAL ELECTRONIC VIEWING/MEASURING EQUIPMENT

William E. Evans and Sidney M. Serebreny *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 135 (For availability see N73-17387 08-13)
(E73-10193; Paper-I15) CSCL 14B
There are no author-identified significant results in this report.

N73-17403* Kansas Univ./Center for Research, Inc., Lawrence.
COMBINED SPECTRAL AND SPATIAL PROCESSING OF ERTS IMAGERY DATA
K. Shanmugam and R. M. Haralick *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 136 (For availability see N73-17387 08-13)
(E73-10194; Paper-I16) CSCL 05B
There are no author-identified significant results in this report.

N73-17404* Itek Corp., Lexington, Mass. Optical Systems Div.
TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES
Nicholas Gramenopoulos *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 137 (For availability see N73-17387 08-13)
(E73-10195; Paper-I17) CSCL 08F
There are no author-identified significant results in this report.

N73-17405* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
CLASSIFICATION OF ERTS-1 MSS DATA BY CANONICAL ANALYSIS
H. M. Lachowski and F. Y. Borden *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 138 (For availability see N73-17387 08-13)
(E73-10196; Paper-I18) CSCL 05B
There are no author-identified significant results in this report.

N73-17406* Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA
Edward Yost and Sandra Wenderoth *In* NASA. Goddard Space Flight Center Interpretation Tech. Develop. 9 Mar. 1973 p 139 (For availability see N73-17387 08-13)
(E73-10197; Paper-I19) CSCL 14E
There are no author-identified significant results in this report.

N73-17407*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LAND USE AND MAPPING
D. W. Mooneyhan, Chairman and A. T. Joyce, Co-chairman 9 Mar. 1973 28 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10198; NASA-TM-X-68925) HC $3.50 CSCL 08B
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17408 through N73-17434.

N73-17408* Georgia Univ., Athens.
CARTOGRAPHIC QUALITY OF ERTS-1 IMAGES
R. I. Welch *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 94 (For availability see N73-17407 08-13)
(E73-10199; Paper-L1) CSCL 08B
There are no author-identified significant results in this report.

N73-17409* Geological Survey, McLean, Va.
PROGRESS IN CARTOGRAPHY, EROS PROGRAM
Alden P. Colvocoresses *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 95 (For availability see N73-17407 08-13)
(E73-10200; Paper-L2) CSCL 08B
There are no author-identified significant results in this report.

N73-17410* Geological Survey, Washington, D.C.
CHANGE IN LAND USE IN THE PHOENIX (1:250000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1972: SUCCESSFUL USE OF A PROPOSED LAND USE CLASSIFICATION SYSTEM
John L. Place *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 96 (For availability see N73-17407 08-13)
(E73-10201; Paper-L3) CSCL 08F
There are no author-identified significant results in this report.

N73-17411* California Univ., Santa Barbara. Geography Remote Sensing Unit.
LAND USE INVESTIGATIONS IN THE CENTRAL VALLEY AND CENTRAL COASTAL TEST SITES, CALIFORNIA
John E. Estes *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 97 (For availability see N73-17407 08-13)
(E73-10202; Paper-L4) CSCL 08F
There are no author-identified significant results in this report.

N73-17412* California Univ., Riverside. Dept. of Geography.
LAND USE IN THE NORTHERN COACHELLA VALLEY
Jack B. Bale and Leonard W. Bowden *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 98 (For availability see N73-17407 08-13)
(E73-10203; Paper-L5) CSCL 08F
There are no author-identified significant results in this report.

N73-17413* Geological Survey, Washington, D.C.
LAND USE CLASSIFICATION AND CHANGE ANALYSIS USING ERTS-1 IMAGERY IN CARETS
Robert H. Alexander *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 99 (For availability see N73-17407 08-13)
(E73-10204; Paper-L6) CSCL 08F
There are no author-identified significant results in this report.

N73-17414* Geological Survey, Washington, D.C.
ERTS REGIONAL SCALE OVERVIEW LINKING LAND USE AND ENVIRONMENTAL PROCESSES IN CARETS
Robert H. Alexander *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 100 (For availability see N73-17407 08-13)
(E73-10205; Paper-L7) CSCL 08F
There are no author-identified significant results in this report.

N73-17415* Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
EVALUATION OF LAND USE MAPPING FROM ERTS IN THE SHORE ZONE OF CARETS
Robert Dolan and Linwood Vincent *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 101 (For availability see N73-17407 08-13)
(E73-10206; Paper-L8) CSCL 08B
There are no author-identified significant results in this report.

N73-17416* Polytechnical Univ. of Madrid (Spain).
INVESTIGATIONS USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITE IN THE FIELDS OF AGRICULTURE/GEOGRAPHY (TIMBER INVENTORY, LAND USE) IN THE PROVINCE OF HUELVA-SPAIN
Emilio DeBenito, Serafin Lopez-Cuervo, and Joaquin Rodriquez *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 102 (For availability see N73-17407 08-13)
(E73-10207; Paper-L9) CSCL 02C
There are no author-identified significant results in this report.

N73-17417* Tennessee Univ., Knoxville. Dept. of Geography.
GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE
John B. Rehder *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 103 (For availability see N73-17407 08-13)
(E73-10208; Paper-L10) CSCL 08F
There are no author-identified significant results in this report.

N73-17418* South Dakota State Univ., Brookings. Dept. of Plant Sciences.
IDENTIFICATION OF SOIL ASSOCIATIONS IN SOUTH DAKOTA ON ERTS A IMAGERY
Frederick C. Westin *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 104 (For availability

see N73-17407 08-13)
(E73-10209; Paper-L11) CSCL 08M
There are no author-identified significant results in this report.

N73-17419* Dartmouth Coll., Hanover, N.H.
LAND USE OF NORTHERN MEGALOPOLIS
Robert B. Simpson and David T. Lindgren *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 105 (For availability see N73-17407 08-13)
(E73-10210; Paper-L12) CSCL 08B
There are no author-identified significant results in this report.

N73-17420* Wyoming Univ., Laramie. Dept. of Geology.
REMOTE SENSING APPLIED TO LAND USE STUDIES IN WYOMING
Roy M. Breckenridge, Ronald W. Marrs, and Donald J. Murphy *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 106 (For availability see N73-17407 08-13)
(E73-10211; Paper-L13) CSCL 08B
There are no author-identified significant results in this report.

N73-17421* Minnesota Univ., Minneapolis. Dept. of Geography.
ERTS-1 APPLICATIONS TO MINNESOTA LAND USE MAPPING
Dwight Brown, Merle P. Meyer, Joseph Ulliman, Steven Prestin, Dale Trippler, James Gamble, and Ralph Eller *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 107 (For availability see N73-17407 08-13)
(E73-10212; Paper-L14) CSCL 08B
There are no author-identified significant results in this report.

N73-17422* Alaska Univ., Fairbanks.
MULTIDISCIPLINARY SURVEYS FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY
John M. Miller and Albert E. Belon *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 108 (For availability see N73-17407 08-13)
(E73-10213; Paper-L15) CSCL 08G
There are no author-identified significant results in this report.

N73-17423* Wisconsin Univ., Madison.
THE USE OF ERTS-1 DATA FOR THE INVENTORY OF CRITICAL LAND RESOURCES FOR REGIONAL LAND USE PLANNING
J. L. Clapp, R. W. Kiefer, M. M. McCarthy, and B. J. Niemann, Jr. *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 109 (For availability see N73-17407 08-13)
(E73-10214; Paper-L16) CSCL 08B
There are no author-identified significant results in this report.

N73-17424* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
INVESTIGATION OF AN URBAN AREA AND ITS LOCALE USING ERTS-1 DATA SUPPORTED BY U-2 PHOTOGRAPHY
H. A. Weeden, F. Y. Borden, N. Bolling, and Danielle N. Applegate *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 110 (For availability see N73-17407 08-13)
(E73-10215; Paper-L17) CSCL 08B
There are no author-identified significant results in this report.

N73-17425* General Electric Co., Philadelphia, Pa. Space Div.
FIRST LOOK ANALYSES OF FIVE CYCLES OF ERTS-1 IMAGERY OVER COUNTY OF LOS ANGELES: ASSESSMENT OF DATA UTILITY FOR URBAN DEVELOPMENT AND REGIONAL PLANNING
S. Raje, R. Economy, and J. McKnight (Los Angeles County Regional Planning Comm.) *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 111 Prepared in cooperation with Los Angeles County Regional Planning Comm. (For availability see N73-17407 08-13)
(E73-10216; Paper-L18) CSCL 08B
There are no author-identified significant results in this report.

N73-17426* Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
PREPARATION OF URBAN LAND USE INVENTORIES BY MACHINE PROCESSING OF ERTS MSS DATA
William J. Todd, Paul E. Mausel, and Kenneth A. Wenner *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 112 (For availability see N73-17407 08-13)
(E73-10217; Paper-L19) CSCL 05B
There are no author-identified significant results in this report.

N73-17427* Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
A COMPARISON OF LAND USE DETERMINATIONS USING DATA FROM ERTS-1 AND HIGH ALTITUDE AIRCRAFT
M. A. Lundelius, V. L. Cook, D. P. McGuigan, S. H. Tunnell, and W. P. Bennett *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 113 (For availability see N73-17407 08-13)
(E73-10218; Paper-L20) CSCL 08B
There are no author-identified significant results in this report.

N73-17428* Environmental Research Inst. of Michigan, Ann Arbor.
DIGITAL LAND USE MAPPING IN OAKLAND COUNTY, MICHIGAN
Irvin J. Sattinger and Robert D. Dillman *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 114 (For availability see N73-17407 08-13)
(E73-10219; Paper-L21) CSCL 08B
There are no author-identified significant results in this report.

N73-17429* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
MAPPING OF AGRICULTURAL LAND USE FROM ERTS-1 DIGITAL DATA
A. David Wilson and G. W. Petersen *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 115 (For availability see N73-17407 08-13)
(E73-10220; Paper-L22) CSCL 08B
There are no author-identified significant results in this report.

N73-17430* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
THE USE OF THE TEMPORAL DIMENSION IN CLASSIFYING AND MAPPING ERTS-1 MSS DATA
F. Yates Borden and Danielle N. Applegate *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 116 (For availability see N73-17407 08-13)
(E73-10221; Paper-L23) CSCL 08B
There are no author-identified significant results in this report.

N73-17431* Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION
F. Y. Borden, D. N. Thompson, and H. M. Lachowski *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 117 (For availability see N73-17407 08-13)
(E73-10222; Paper-L24) CSCL 08B
There are no author-identified significant results in this report.

N73-17432* Honeywell, Inc., Roseville, Minn.
AUTOMATIC LAND USE CLASSIFICATION IN MINNESOTA
Michael Cheung, Deborah Pile, George Swanlund, and Raymond Zirkle *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 118 (For availability see N73-17407 08-13)
(E73-10223; Paper-L25) CSCL 08B
There are no author-identified significant results in this report.

N73-17433* Environmental Research Inst. of Michigan, Ann Arbor.
LAND RESOURCES SURVEY OF THE STATE OF MICHIGAN
Buzz Sellman *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 119 (For availability see N73-17407 08-13)
(E73-10224; Paper-L26) CSCL 08G
There are no author-identified significant results in this report.

N73-17434* Environmental Research Inst. of Michigan, Ann Arbor.
TERRAIN CLASSIFICATION MAPS OF YELLOWSTONE NATIONAL PARK
F. J. Thomson *In* NASA. Goddard Space Flight Center Land Use and Mapping 9 Mar. 1973 p 120 (For availability see N73-17407 08-13)
(E73-10225; Paper-L27) CSCL 08B
There are no author-identified significant results in this report.

N73-17435*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MARINE RESOURCES AND OCEAN SURVEYS
J. R. Greaves, Chairman and E. L. Tilton, Co-Chairman 9 Mar. 1973 21 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10226; NASA-TM-X-68926) Avail: NTIS HC $3.25 CSCL 08J
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17436 through N73-17455.

N73-17436* Johns Hopkins Univ., Baltimore, Md.
SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES
Turbit H. Slaughter *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 140 (For availability see N73-17435 08-13)
(E73-10227; Paper-M1) CSCL 08J
There are no author-identified significant results in this report.

N73-17437* Johns Hopkins Univ., Baltimore, Md.
RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY
Randall T. Kerhin *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 141 (For availability see N73-17435 08-13)
(E73-10228; Paper-M2) CSCL 08J
There are no author-identified significant results in this report.

N73-17438* Delaware Univ., Newark. Coll. of Marine Studies.
APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS
V. Klemas, R. Srna, and W. Treasure *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 142 (For availability see N73-17435 08-13)
(E73-10229; Paper-M3) CSCL 08J
There are no author-identified significant results in this report.

N73-17439* National Aeronautics and Space Administration. Langley Research Center, Langley Station, Va.
CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY
D. E. Bowker, P. Fleischer, T. A. Gosink (Old Dominion Univ.), W. J. Hanna (Old Dominion Univ.), and J. C. Ludwick (Old Dominion Univ.) *In its* Marine Resources and Ocean Surv. 9 Mar. 1973 p 143 Prepared in cooperation with Old Dominion Univ. (For availability see N73-17435 08-13)
(E73-10230; Paper-M4) CSCL 08A
There are no author-identified significant results in this report.

N73-17440* Geological Survey, Hartford, Conn.
PLUME DEVELOPMENT IN LONG ISLAND SOUND OBSERVED BY REMOTE SENSING
Frederick H. Ruggles, Jr. *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 144 (For availability see N73-17435 08-13)
(E73-10231; Paper-M5) CSCL 08A
There are no author-identified significant results in this report.

N73-17441* Geological Survey, Menlo Park, Calif.
OBSERVATIONS OF SUSPENDED PARTICLE PATTERNS IN NEARSHORE NORTHEASTERN PACIFIC OCEAN WATERS BY ERTS-1 IMAGERY
Paul R. Carlson, Richard J. Janda, and T. John Conomos *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 145 (For availability see N73-17435 08-13)
(E73-10232; Paper-M6) CSCL 08J
There are no author-identified significant results in this report.

N73-17442* Geological Survey, Menlo Park, Calif.
NEW INSIGHTS INTO THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA FROM FIELD DATA AND ERTS-1 IMAGERY
Peter W. Barnes and Erk Reimnitz *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 146 (For availability see N73-17435 08-13)
(E73-10233; Paper-M7) CSCL 08J
There are no author-identified significant results in this report.

N73-17443* Alaska Univ., Fairbanks. Inst. of Marine Science.
ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA
F. F. Wright, G. D. Sharma, and D. C. Burbank *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 147 (For availability see N73-17435 08-13)
(E73-10234; Paper-M8) CSCL 08J
There are no author-identified significant results in this report.

N73-17444* Army Cold Regions Research and Engineering Lab., Hanover, N.H.
SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA
Duwayne M. Anderson, Lawrence W. Gatto, and Harlan L. McKim *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 148 (For availability see N73-17435 08-13)
(E73-10235; Paper-M9) CSCL 08J
There are no author-identified significant results in this report.

N73-17445* Geological Survey, Corpus Christi, Tex.
DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST
Ralph E. Hunter *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 149 (For availability see N73-17435 08-13)
(E73-10236; Paper-M10) CSCL 08J
There are no author-identified significant results in this report.

N73-17446* Arizona Univ., Tucson. Office of Arid Land Studies.
OCEANOGRAPHIC MAPPING OF STRUCTURE AND DYNAMICS OF THE NORTHERN GULF OF CALIFORNIA BY THE USE OF SPECTRAL MODELING
L. K. Lepley, Gustavo Calderon, and J. R. Hendrickson *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 150 (For availability see N73-17435 08-13)
(E73-10237; Paper-M11) CSCL 08C
There are no author-identified significant results in this report.

N73-17447* National Oceanic and Atmospheric Administration, Miami, Fla. Environmental Research Labs.
OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA
Kirby J. Hanson *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 151 (For availability see N73-17435 08-13)
(E73-10238; Paper-M12) CSCL 08J
There are no author-identified significant results in this report.

N73-17448* National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY
George A. Maul *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 152 (For availability see N73-17435 08-13)
(E73-10239; Paper-M13) CSCL 08C
There are no author-identified significant results in this report.

N73-17449* Environmental Research and Technology, Inc., Lexington, Mass.
USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE
James C. Barnes *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 153 (For availability see N73-17435 08-13)
(E73-10240; Paper-M14) CSCL 08B
There are no author-identified significant results in this report.

N73-17450* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
BIOMASS IN THE UPWELLING AREAS ALONG THE NORTHWEST COAST OF AFRICA AS VIEWED WITH ERTS-1
Karl-Heinz Szekielda (Delaware Univ.) and R. J. Curran *In its* Marine Resources and Ocean Surv. 9 Mar. 1973 p 154 Prepared in cooperation with Delaware Univ. (For availability see N73-17435 08-13)
(E73-10241; Paper-M15) CSCL 08A
There are no author-identified significant results in this report.

N73-17451* Arizona Univ., Tucson. Dept. of Biological Sciences.
ERTS IMAGERY AS AN AID TO FISHERIES MANAGEMENT IN THE NORTHERN GULF OF CALIFORNIA
J. R. Hendrickson, Alfredo Cota, Gustavo Calderon, and L. K. Lepley *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 155 (For availability see N73-17435 08-13)
(E73-10242; Paper-M16) CSCL 08A
There are no author-identified significant results in this report.

N73-17452* Earth Satellite Corp., Washington, D.C.
APPLICATION OF ERTS-1 IMAGERY TO THE HARVEST MODEL OF THE US MENHADEN FISHERY
Paul M. Maughan *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 156 (For availability see N73-17435 08-13)
(E73-10243; Paper-M17) CSCL 08A
There are no author-identified significant results in this report.

N73-17453* Geological Survey, Washington, D.C. EROS Program Office.
PLYMOUTH AND DUXBURY BAYS, MASSACHUSETTS: SUBAERIAL AND SUBMARINE FEATURES DEPICTED ON MSS IMAGERY AS COMPARED WITH AERIAL PHOTOGRAPHY AND CONVENTIONAL MAPS AT 1:1000000; 1:250000; AND 1:125000 SCALES
Richard S. Williams, Jr. *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 157 (For availability see N73-17435 08-13)
(E73-10244; Paper-M18) CSCL 08J
There are no author-identified significant results in this report.

N73-17454* International Imaging Systems, Mountain View, Calif.
WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY
D. S. Ross *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 158 (For availability see N73-17435 08-13)
(E73-10245; Paper-M19) CSCL 08J
There are no author-identified significant results in this report.

N73-17455* Environmental Research Inst. of Michigan, Ann Arbor.
CALCULATIONS OF WATER DEPTH FROM ERTS-MSS DATA
Fabian C. Polcyn *In* NASA. Goddard Space Flight Center Marine Resources and Ocean Surv. 9 Mar. 1973 p 159 (For availability see N73-17435 08-13)
(E73-10246; Paper-M20) CSCL 08J
There are no author-identified significant results in this report.

N73-17456*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MULTIDISCIPLINARY/REGIONAL RESOURCE SURVEYS
G. Trafford, Chairman 9 Mar. 1973 7 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10247; NASA-TM-X-68940) Avail: NTIS HC $3.00 CSCL 08F
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17457 through N73-17462.

N73-17457* North Carolina State Univ., Raleigh.
MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT
Charles W. Welby, Joe O. Lammi, and Robert J. Carson *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 1-60 (For availability see N73-17456 08-13)
(E73-10248; Paper-R1) CSCL 08F
There are no author-identified significant results in this report.

N73-17458* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY
G. H. Simonson, D. P. Paine, C. E. Poulton, R. D. Laurence, J. H. Herzog, and R. J. Murray *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 161 (For availability see N73-17456 08-13)
(E73-10249; Paper-R2) CSCL 08F
There are no author-identified significant results in this report.

N73-17459* State of Ohio Dept. of Development, Columbus.
RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO
David C. Sweet, Terry L. Wells, and George E. Wukelic (Battelle Columbus Labs., Ohio) *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 162 Prepared in cooperation with Battelle Columbus Labs., Ohio. (For availability see N73-17456 08-13)
(E73-10250; Paper-R3) CSCL 08F
There are no author-identified significant results in this report.

N73-17460* California Univ., Riverside. Dept. of Geography.
ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1
Leonard W. Bowden and James H. Viellenave *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 163 (For availability see N73-17456 08-13)
(E73-10251; Paper-R4) CSCL 08F
There are no author-identified significant results in this report.

N73-17461* American Univ., Washington, D.C. Dept. of Biology.
APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI)
N. H. MacLeod *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 164 (For availability see N73-17456 08-13)
(E73-10252; Paper-R5) CSCL 08F
There are no author-identified significant results in this report.

N73-17462* Institut Francais du Petrole, Rueil-Malmaison.
FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA
A. Fontanel, J. Guillemot, and M. Guy *In* NASA. Goddard Space Flight Center Multidisciplinary/Regional Resource Surv. 9 Mar. 1973 p 165 (For availability see N73-17456 08-13)
(E73-10253; Paper-R6) CSCL 08F
There are no author-identified significant results in this report.

N73-17463*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
WATER RESOURCES
V. V. Salomonson, Chairman and A. Rango, Co-chairman 9 Mar. 1973 21 p Presented at Symp. on Significant Results Obtained from ERTS-1, New Carrollton, Md., 5-9 Mar. 1973
(E73-10254; NASA-TM-X-68941) Avail: NTIS HC $3.25 CSCL 08H
Abstracts of papers given at the Symposium on Significant Results Obtained from ERTS-1, held at New Carrollton, Md., 5-9 March 1973, are presented. For individual titles, see N73-17464 through N73-17483.

N73-17464* Geological Survey, Washington, D.C.
HYDROGEOLOGY OF CLOSED BASINS AND DESERTS OF SOUTH AMERICA, ERTS-1 INTERPRETATIONS
George E. Stoertz and William D. Carter *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 74 (For availability see N73-17463 08-13)
(E73-10255; Paper-W1) CSCL 08H
There are no author-identified significant results in this report.

N73-17465* Polytechnical Univ. of Madrid (Spain). Superior Technical School of Agricultural Engineering.
DETECTION OF MAJOR RIVER BED CHANGES IN THE RIVER EBRO (NORTH-EASTERN SPAIN)
R. Espejo, J. Torrent, and C. Roquero *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 75 (For availability see N73-17463 08-13)
(E73-10256; Paper-W2) CSCL 08H
There are no author-identified significant results in this report.

N73-17466* Mekong Committee Secretariat, Bangkok (Thailand).
APPLICATIONS OF MULTISPECTRAL PHOTOGRAPHY TO WATER RESOURCES DEVELOPMENT PLANNING IN THE LOWER MEKONG BASIN (KHMER REPUBLIC, LAOS, THAILAND AND VIET-NAM)
Willem J. VanLiere *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 76 (For availability see N73-17463 08-13)
(E73-10257; Paper-W3) CSCL 08H
There are no author-identified significant results in this report.

N73-17467* Geological Survey, Nashville, Tenn. Water Resources Div.
PRELIMINARY TEST OF ERTS-1 IMAGERY FOR IMPROVING DEFINITION OF NATURAL STREAMFLOW
Este F. Hollyday *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 77 (For availability see N73-17463 08-13)
(E73-10258; Paper-W4) CSCL 08H
There are no author-identified significant results in this report.

N73-17468* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
APPLICATION OF ERTS-1 IMAGERY TO FLOOD INUNDATION MAPPING
George R. Hallberg (Iowa Geol. Survey Remote Sensing Lab.), Bernard E. Hoyer (Iowa Geol. Survey Remote Sensing Lab.), and Albert Rango *In its* Water Resources 9 Mar. 1973 p 78 Prepared in cooperation with Iowa Geol. Surv. Remote Sensing Lab. (For availability see N73-17463 08-13)
(E73-10259; Paper-W5) CSCL 08H
There are no author-identified significant results in this report.

N73-17469* Geological Survey, Denver, Colo.
ASSESSMENT OF FLOOD DAMAGE IN ARIZONA BY MEANS OF ERTS-1 IMAGERY
Roger B. Morrison *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 79 (For availability see N73-17463 08-13)
(E73-10260; Paper-W6) CSCL 08H
There are no author-identified significant results in this report.

N73-17470* Geological Survey, Tucson, Ariz.
USE OF THE SRI SATELLITE IMAGE ANALYZER CONSOLE FOR MAPPING SOUTHERN ARIZONA PLANT COMMUNITIES FROM ERTS-1 IMAGERY
Raymond M. Turner *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 80 (For availability see N73-17463 08-13)
(E73-10261; Paper-W7) CSCL 08B
There are no author-identified significant results in this report.

N73-17471* Geological Survey, Phoenix, Ariz. Water Resources Div.
MONITORING OF STREAMFLOW IN THE VERDE RIVER BY ERTS-1 DATA COLLECTION SYSTEM (DCS)
Herbert H. Schumann *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 81 (For availability see N73-17463 08-13)
(E73-10262; Paper-W8) CSCL 08H
There are no author identified significant results in this report.

N73-17472* Geological Survey, Harrisburg, Pa.
PRELIMINARY ANALYSIS OF ERTS RELAYED WATER RESOURCES DATA IN THE DELAWARE RIVER BASIN
Richard W. Paulson *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 82 (For availability see N73-17463 08-13)
(E73-10263; Paper-W9) CSCL 08H
There are no author-identified significant results in this report.

N73-17473* Geological Survey, Miami, Fla.
MODELING SUBTROPICAL WATER-LEVEL DYNAMICS DISTRIBUTION
A. L. Higer, E. A. Cordes, and A. E. Coker *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 83 (For availability see N73-17463 08-13)
(E73-10264; Paper-W10) CSCL 08H
There are no author-identified significant results in this report.

N73-17474* Bureau of Sport Fisheries and Wildlife, Washington, D.C.
AN EVALUATION OF SPACE ACQUIRED DATA AS A TOOL FOR MANAGEMENT OF WILDLIFE HABITAT IN THE STATE OF ALASKA
Bill J. VanTries *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 84 (For availability see N73-17463 08-13)
(E73-10265; Paper-W11) CSCL 08F
There are no author-identified significant results in this report.

N73-17475* Bureau of Sport Fisheries and Wildlife, Jamestown, N.D. Northern Prairie Wildlife Research Center.
PRELIMINARY EVALUATION OF ERTS-1 FOR DETERMINING NUMBERS AND DISTRIBUTION OF PRAIRIE PONDS AND LAKES
David S. Gilmer, Albert T. Klett, and Edward A. Work, Jr. (Environ. Res. Inst. of Mich.) *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 85 Prepared in cooperation with Environmental Res. Inst. of Mich. (For availability see N73-17463 08-13)
(E73-10266; Paper-W12) CSCL 08H
There are no author-identified significant results in this report.

N73-17476* Texas Technological Univ., Lubbock. Dept. of Geosciences.
DYNAMICS OF PLAYA LAKES IN THE TEXAS HIGH PLAINS
C. C. Reeves, Jr. *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 86 (For availability see N73-17463 08-13)
(E73-10267; Paper-W13) CSCL 08H
There are no author-identified significant results in this report.

N73-17477* Guelph Univ. (Ontario).
HYDROLOGIC STUDIES IN THE LAKE ONTARIO BASIN USING HIGH ALTITUDE AND ERTS-1 IMAGERY
A. Falconer *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 87 (For availability see N73-17463 08-13)
(E73-10268; Paper-W14) CSCL 08H
There are no author-identified significant results in this report.

N73-17478* Environmental Research Inst. of Michigan, Ann Arbor.
PROGRESS OF AN ERTS-1 PROGRAM FOR LAKE ONTARIO AND ITS BASIN
Fabian C. Polcyn and Thomas W. Wagner *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 88 (For availability see N73-17463 08-13)
(E73-10269; Paper-W15) CSCL 08H
There are no author-identified significant results in this report.

N73-17479* Geological Survey, Arlington, Va. Water Resources Div.
REMOTE SENSING OF TURBIDITY PLUMES IN LAKE ONTARIO
Edward J. Pluhowski *In* NASA. Goddard Space Flight Center

Water Resources 9 Mar. 1973 p 89 (For availability see N73-17463 08-13)
(E73-10270; Paper-W16) CSCL 08H
There are no author-identified significant results in this report.

N73-17480* Wisconsin Univ., Milwaukee. Coll. of Engineering and Applied Science.
ERTS-1 VIEWS THE GREAT LAKES AREA
Walter A. Lyons and Steven R. Pease *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 90 (For availability see N73-17463 08-13)
(E73-10271; Paper-W17) CSCL 08H
There are no author-identified significant results in this report.

N73-17481* Environmental Research and Technology, Inc., Lexington, Mass.
USE OF ERTS DATA FOR MAPPING SNOW COVER IN THE WESTERN UNITED STATES
James C. Barnes *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 91 (For availability see N73-17463 08-13)
(E73-10272; Paper-W18) CSCL 08L
There are no author-identified significant results in this report.

N73-17482* Geological Survey, Tacoma, Wash.
EVALUATE ERTS IMAGERY FOR MAPPING AND DETECTION OF CHANGES OF SNOWCOVER ON LAND AND ON GLACIERS
Mark F. Meier *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 92 (For availability see N73-17463 08-13)
(E73-10273; Paper-W19) CSCL 08L
There are no author-identified significant results in this report.

N73-17483* Geological Survey, Miami, Fla.
DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1
A. E. Coker, Aaron Higer, and Carl R. Goodwin *In* NASA. Goddard Space Flight Center Water Resources 9 Mar. 1973 p 93 (For availability see N73-17463 08-13)
(E73-10274; Paper-W20) CSCL 08J
There are no author-identified significant results in this report.

N73-17484*# Alaska Univ., Palmer. Inst. of Agricultural Sciences.
IDENTIFICATION OF PHENOLOGICAL STAGES AND VEGETATIVE TYPES FOR LAND USE CLASSIFICATION Semiannual Report, Jul. 1972 - Jan. 1973
C. Ivan Branton, Principal Investigator and J. D. McKendrick 20 Feb. 1973 13 p
(Contract NAS5-21833)
(E73-10276; NASA-CR-130559) Avail: NTIS HC $3.00 CSCL 08F
There are no author-identified significant results in this report.

N73-17485*# Alaska Univ., Fairbanks. Geophysical Inst.
GLACIOLOGICAL AND VOLCANOLOGICAL STUDIES IN THE WRANGELL MOUNTAINS, ALASKA Progress Report, Jul. 1972 - Jan. 1973
Carl S. Benson, Principal Investigator and Lewis H. Shapiro 20 Feb. 1973 9 p
(Contract NAS5-21833)
(E73-10277; NASA-CR-130560) Avail: NTIS HC $3.00 CSCL 08F
There are no author-identified significant results in this report.

N73-17486*# Environmental Research and Technology, Inc., Lexington, Mass.
USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE Progress Report, 28 Jun. - 31 Dec. 1972
James C. Barnes, Principal Investigator and C. James Bowley Feb. 1973 29 p
(Contract NAS5-21802)
(E73-10278; NASA-CR-130561; ERT-P-408-3) Avail: NTIS HC $3.50 CSCL 08B
There are no author-identified significant results in this report.

N73-17487*# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
ARCTIC AND SUBARCTIC ENVIRONMENTAL ANALYSES UTILIZING ERTS-1 IMAGERY Bimonthly Progress Report, 23 Dec. 1972 - 23 Feb. 1973
Duwayne M. Anderson, H. L. McKim, R. K. Haugen, L. W. Gatto, C. W. Slaughter, and T. Marlar, Principal Investigators 23 Feb. 1973 4 p
(NASA Order S-70253-AG)
(E73-10279; NASA-CR-130562; BMPR-3) Avail: NTIS HC $3.00 CSCL 08F
There are no author-identified significant results in this report.

N73-17488*# Montana Univ., Missoula. Dept. of Geology.
APPLICABILITY OF ERTS-1 TO MONTANA GEOLOGY Interim Report, Aug. 1972 - Jan. 1973
Robert M. Weidman, Principal Investigator 19 Feb. 1973 30 p refs Original contains imagery. Original photography may be purchased from the EROS Data Center, 10th and Dakota Avenue, Sioux Falls, S. D. 57198
(Contract NAS5-21826)
(E73-10280; NASA-CR-130563) Avail: NTIS HC $3.50 CSCL 08G
The author has identified the following significant results. Geologic maps of four test sites were compiled at 1/250,000. Band 7 prints enlarged to 1/500,000 scale are the best for the purpose, and negative prints provide a valuable supplement. More than 100 mapped lineaments represent most of the major faults of the area and a large number of suspected faults, including many of northeast trend. Under ideal conditions dip slopes may be recognized, laccoliths outlined, and axial traces drawn for narrow, plunging folds. Use of ERTS-1 imagery will greatly facilitate construction of a needed tectonic map of Montana. From ERTS-1 imagery alone, it was possible to identify upturned undivided Paleozoic and Mesozoic strata and to map the boundaries of mountain glaciation, intermontane basins, a volcanic field, and an area of granitic rocks. It was also possible to outline clay pans associated with bentonite. However, widespread recognition of gross rock types will be difficult.

N73-17489*# Alaska Univ., Fairbanks. Geophysical Inst.
SURVEY OF THE SEASONAL SNOW COVER OF ALASKA Progress Report, Jul. 1972 - Jan. 1973
C. S. Benson, Principal Investigator and B. Holmgren 20 Feb. 1973 16 p
(Contract NAS5-21833)
(E73-10282; NASA-CR-130565) Avail: NTIS HC $3.00 CSCL 08L
There are no author-identified significant results in this report.

N73-17490*# Alaska Univ., Fairbanks. Dept. of Geology.
ERTS-A DATA AS A TEACHING AND RESEARCH TOOL IN THE DEPARTMENT OF GEOLOGY Progress Report, Jul. 1972 - Jan. 1973
Donald Grybeck, Principal Investigator 20 Feb. 1973 4 p
(Contract NAS5-21833)
(E73-10284; NASA-CR-130567) Avail: NTIS HC $3.00 CSCL 08G
There are no author-identified significant results in this report.

N73-17491*# Alaska Univ., Fairbanks. Alaska Cooperative Wildlife Research Unit.
APPLICATION OF ERTS-1 IMAGERY TO THE STUDY OF CARIBOU MOVEMENTS AND WINTER DISPERSAL IN RELATION TO PREVAILING SNOWCOVER Progress Report, Jul. 1972 - Jan. 1973
Peter C. Lent, Principal Investigator and Arthur J. Laperriere 20 Feb. 1973 12 p refs
(Contract NAS5-21833)
(E73-10285; NASA-CR-130568) Avail: NTIS HC $3.00 CSCL 06C
There are no author-identified significant results in this report.

N73-17492*# Servicio Geologico de Bolivia, La Paz.
EARTH RESOURCES TECHNOLOGY SATELLITE DATA COLLECTION PROJECT ERTS-A BOLIVIA Progress Report, Sep. 1972 - Jan. 1973
Carlos E. Brockmann, Principal Investigator Jan. 1973 9 p

Sponsored by NASA
(E73-10286; NASA-CR-130569) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-17493*# TRW Systems Group, Redondo Beach, Calif.
ERTS IMAGE DATA COMPRESSION TECHNIQUE EVALUATION Monthly Progress Report, period ending 1 Feb. 1973
Donald J. Spencer, Principal Investigator and Curtis L. May 7 Feb. 1973 1 p
(Contract NAS5-21746)
(E73-10287; NASA-CR-130570; TRW-7132.1-07) Avail: NTIS HC $3.00 CSCL 05B

There are no author-identified significant results in this report.

N73-17494*# American Univ., Washington, D.C. Dept. of Biology.
ERTS-1 DATA USER INVESTIGATION OF WETLAND ECOLOGY Progress Report
Richard R. Anderson, Principal Investigator 15 Feb. 1973 3 p
(Contract NAS5-21752)
(E73-10288; NASA-CR-130571; PR-4) Avail: NTIS HC $3.00 CSCL 08H

There are no author-identified significant results in this report.

N73-17495*# Earth Satellite Corp., Berkeley, Calif.
A SCHEME FOR THE UNIFORM MAPPING AND MONITORING OF EARTH RESOURCES AND ENVIRONMENTAL COMPLEXES USING ERTS-1 IMAGERY Progress Report, 1 Jul. - 31 Dec. 1972
Charles E. Poulton, Principal Investigator and Robin I. Welch 31 Jan. 1973 29 p
(Contract NAS5-21830)
(E73-10289; NASA-CR-130572; PR-1) Avail: NTIS HC $3.50 CSCL 08B

There are no author-identified significant results in this report. Progress on plans for the development and testing of a practical procedure and system for the uniform mapping and monitoring of natural ecosystems and environmental complexes from space-acquired imagery is discussed. With primary emphasis on ERTS-1 imagery, but supported by appropriate aircraft photography as necessary, the objectives are to accomplish the following: (1) Develop and test in a few selected sites and areas of the western United States a standard format for an ecological and land use legend for making natural resource inventories on a simulated global basis. (2) Based on these same limited geographic areas, identify the potentialities and limitations of the legend concept for the recognition and annotation of ecological analogs and environmental complexes. An additional objective is to determine the optimum combination of space photography, aerial photography, ground data, human data analysis, and automatic data analysis for estimating crop yield in the rice growing areas of California and Louisiana. A.L.

N73-17496*# Alaska Univ., Fairbanks. Inst. of Marine Science.
THE CIRCULATION OF PRINCE WILLIAM SOUND Progress Report, Jul. 1972 - Jan. 1973
Robin D. Muench, Principal Investigator 20 Feb. 1973 12 p
(Contract NAS5-21833)
(E73-10291; NASA-CR-130574) Avail: NTIS HC $3.00 CSCL 08C

The author has identified the following significant results. Results suggest that sediment-laden plumes of fresh water from rivers may be useful tracers, due to their high visibility, of surface water motion. The two useable images obtained to date corroborate that westerly flow was occurring in the Gulf of Alaska just south of Prince William Sound, and that an inflow into Prince William Sound was occurring concurrently with flood tides on both occasions. River plumes are useful tracers, but poor weather conditions somewhat limit the use of satellite imagery.

N73-17497*# Alaska Univ., Fairbanks. Inst. of Water Resources.
BREAK-UP CHARACTERISTICS OF CHENA RIVER BASIN Progress Report, Jul. 1972 - Jan. 1973
Robert F. Carlson, Principal Investigator 20 Feb. 1973 12 p
(Contract NAS5-21833)
(E73-10292; NASA-CR-130575) Avail: NTIS HC $3.00 CSCL 08H

The author has identified the following significant results. While visually analyzing ERTS-1 data for August and September, 1972, it was found that lakes as small as 200 feet in diameter were visible on the imagery. An examination of the imagery for the Minto Lakes area shows that the lakes take on their darkest appearance in MSS band 6. The Tanana River which flows through this area appears quite light in band 5, quite dark in band 7, and is almost undetectable for band 6. The significance of these data are that potential surface storage could be measured for watersheds that have substantial numbers of lakes. This potential storage would be available to both spring runoff and summer precipitation. Caution must be shown because certain clouds cast a shadow that is similar to the lake appearance. The difference of the imagery for a lake and a river of the same band is due to the sediment load for the river. The Tanana River had a heavy glacial sediment load. The area of snow cover during the fall accumulation can be mapped in detail.

N73-17498*# Alabama Univ., Huntsville. School of Graduate Studies and Research.
THE RESPONSES OF THE THERMOSPHERE DUE TO A GEOMAGNETIC STORM: A MHD MODEL Interim Report
S. T. Wu and Shih-Chih Chang Dec. 1972 44 p refs
(Contract NAS8-25750)
(NASA-CR-124071; UAH-122) Avail: NTIS HC $4.25 CSCL 04A

A magnetohydrodynamics theory was used to study the dynamic response of the neutral atmosphere to a geomagnetic storm. A full set of magnetohydrodynamic equations appropriate for the present problem is derived and their various orders of approximation are discussed in some detail. In order to demonstrate the usefulness of this theoretical model, the May 1967 geomagnetic storm data were used in the resulting set of nonlinear, time dependent, partial differential magnetohydrodynamic equations to calculate variations of the thermosphere due to the storm. The numerical results are presented for wind speeds, electric field strength, and amount of joule heating at a constant altitude for the data recorded. Data show that the strongest thermospheric responses are at the polar region becoming weaker in the equatorial region. This may lead to the speculation that a thermospheric wave is generated in the polar region due to the geomagnetic storm which propagates towards the equator. Author

N73-17499*# California Inst. of Tech., Pasadena.
FOUNDATIONS FOR A THEORY OF GRAVITATION THEORIES
Kip S. Thorne, David L. Lee, and Alan P. Lightman [1972] 45 p refs Sponsored in part by Imperial Oil
(Grants NGR-05-002-256; NSF GP-27304; NSF GP-28027)
(NASA-CR-130753) Avail: NTIS HC $4.25 CSCL 08N

A foundation is laid for future analyses of gravitation theories. This foundation is applicable to any theory formulated in terms of geometric objects defined on a 4-dimensional spacetime manifold. The foundation consists of (1) a glossary of fundamental concepts; (2) a theorem that delineates the overlap between Lagrangian-based theories and metric theories; (3) a conjecture (due to Schiff) that the Weak Equivalence Principle implies the Einstein Equivalence Principle; and (4) a plausibility argument supporting this conjecture for the special case of relativistic, Lagrangian-based theories. Author

N73-17500*# California Inst. of Tech., Pasadena.
AN ANALYSIS OF THE BELINFANTE-SWIHART THEORY OF GRAVITY
David L. Lee and Alan P. Lightman [1972] 22 p refs
(Grants NGR-05-002-256; NSF GP-27304; NSF GP-28027)
(NASA-CR-130754) Avail: NTIS HC $3.25 CSCL 08N

The Belinfante-Swihart (BS) theory is reformulated in a representation in which uncharged matter responds to gravity in the same way as in metric theories. The BS gravitationally modified Maxwell equations are also put into metric form to first order in the deviations of the physical metric from flat space, but not to second order; consequently the theory is nonmetric except in first order. Also shown is that the theory violates the high precision Eotvos-Dicke experiment, but cannot be ruled out by the gravitational precession of gyroscopes. Author

N73-17501# Osservatorio Geofisico Sperimentale, Trieste (Italy).
BATHYMETRY, GRAVITY AND MAGNETISM IN THE STRAIT OF SICILY
C. Morelli 1972 16 p Presented at Oceanog. of the Strait of Sicily Conf. held at SACLANTCEN, 11-12 Apr. 1972 Sponsored by CNR
(SACLANTCEN-Conf-Proc-7; Contrib-211) Avail: NTIS HC $3.00

Data from 11 cruises covering the Strait of Sicily from 1965 to 1971 are described and presented in charts with a 1:750,000 scale. The bathymetry data give details for the continental bridge between Sicily and Africa. Free air gravity anomalies are in general positive, confirming the general tendency of the area to sink. The magnetic field is mainly regular, and the magnetic anomalies are indicated. Author

N73-17502*# Minnesota Univ., Minneapolis. Space Science Center.
A STUDY OF MINNESOTA FORESTS AND LAKES USING DATA FROM EARTH RESOURCES TECHNOLOGY SATELLITES Six-Month Progress Report, 1 Jul. - 31 Dec. 1972
31 Dec. 1972 39 p refs
(Grant NGL-24-005-263)
(NASA-CR-130548) Avail: NTIS HC $4.00 CSCL 08B

This project is to foster and develop new applications of remote sensing under an interdisciplinary effort. Seven reports make up the specific projects presently being conducted throughout the State of Minnesota in cooperation with several agencies and municipalities. These are included under the general headings of: (1) applications of aerial photography and ERTS-1 data to agricultural, forest, and water resources management; (2) classification and dynamics of water and wetland resources of Minnesota; (3) studies of Lake Superior Bay; and (4) feasibility of detecting major air pollutants by earth-oriented satellite-borne sensors. Author

N73-17503*# Stanford Research Inst., Menlo Park, Calif.
ATMOSPHERIC ELECTRICITY AND THE APOLLO SERIES Scientific Note, 1969 - 1972
Joseph E. Nanevicz, Edward T. Pierce, and Arthur L. Whitson Jun. 1972 84 p refs Sponsored in part by NASA
(Contract N00014-71-C-0106; SRI Proj. 4454)
(NASA-CR-130535; AD-745781; Sci-Note-18) Avail: NTIS HC $6.25 CSCL 04/1

Ground-test measurements were made during the launches of Apollo 13 and 14 in an effort to better define the electrical characteristics of a large launch vehicle. Of particular concern was the effective electrical length of the vehicle and plume since this parameter markedly affects the likelihood of a lightning stroke being triggered by a launch during disturbed weather conditions. Since no instrumentation could be carried aboard the launch vehicle, the experiments were confined to LF radio noise and electrostatic-field measurements on the ground in the vicinity of the launch pad. The philosophy of the experiment and the instrumentation and layout are described. Author (GRA)

N73-17504*# Georgia Inst. of Tech., Atlanta. School of Aerospace Engineering.
SHORT AND LONG PERIODIC ATMOSPHERIC VARIATIONS BETWEEN 25 AND 200 km
C. G. Justus and Arthur Woodrum Washington NASA Feb. 1973 90 p refs
(Contract NAS8-26658)
(NASA-CR-2203; E-16-612) Avail: NTIS HC $3.00 CSCL 04A

Previously collected data on atmospheric pressure, density, temperature and winds between 25 and 200 km from sources including Meteorological Rocket Network data, ROBIN falling sphere data, grenade release and pitot tube data, meteor winds, chemical release winds, satellite data, and others were analyzed by a daily difference method and results on the distribution statistics, magnitude, and spatial structure of gravity wave and planetary wave atmospheric variations are presented. Time structure of the gravity wave variations was determined by the analysis of residuals from harmonic analysis of time series data. Planetary wave contributions in the 25-85 km range were discovered and found to have significant height and latitudinal variation. Long period planetary waves and seasonal variations were also computed by harmonic analysis. Revised height variations of the gravity wave contributions in the 25 to 85 km height range were computed. An engineering method and design values for gravity wave magnitudes and wave lengths are given to be used for such tasks as evaluating the effects on the dynamical heating, stability and control of spacecraft such as the space shuttle vehicle in launch or reentry trajectories. Author

N73-17505*# Stanford Univ., Calif. Inst. for Plasma Research.
SOLAR MAGNETIC SECTOR STRUCTURE: INFLUENCE ON STRATOSPHERIC CIRCULATION
John M. Wilcox, Philip H. Scherrer, Leif Svalgaard, Walter Orr Roberts, and Roger H. Olson Jan. 1973 10 p refs
(Grant NGR-05-020-559; Contract N00014-67-A-0112-0068; Grant NSF GA-31138)
(NASA-CR-130551; SU-IPR-501) Avail: NTIS HC $3.00 CSCL 04A

The solar magnetic sector structure appears to influence the average area of high positive vorticity centers (low pressure troughs) observed during winter in the northern hemisphere at the 300 mb level. The average area of high vorticity decreases during a few days near the times at which sector boundaries are carried past the earth by the solar wind. The amplitude of the effect is about ten percent. Author

N73-17506# Technischen Universitaet, Munich (West Germany).
PERTURBATION THEORY FOR CALCULATING VERTICAL IONIZATION ENERGIES AND ELECTRON AFFINITIES OF FREE MOLECULES Ph.D. Thesis [STOERUNGSTHEORETISCHE BERECHNUNG VON VERTIKALEN IONISIERUNGSENERGEIN UND ELEKTRONENAFFINITAETEN FREIER MOLEKUELE]
Srulek Lorenz Cederbaum 1972 115 p refs In GERMAN
Avail: NTIS HC $7.75

The two point Green function of an N electron system in which the omega representation includes poles is used to reproduce ionization energies and electron affinities of free molecules. Perturbation theoretical approximation of the Green function is obtained by using the Hartree-Fock operator as undisturbed Hamiltonian operator of the closed shell system and for indefinite graphical representation of the mass operator. Transl. by G.G.

N73-17507# Ionospharen-Institut Breisach (West Germany).
IONOSPHERE DATA, VERTICAL-ECHO-SOUNDING: FREIBURG URSI-CODE 131, OCTOBER 1972 [IONOSPHAEREN-DATEN VERTIKAL-ECHO-LOTUNG: FREIBURG URSI-CODE 131, OKTOBER 1972]
Oct. 1972 44 p refs In GERMAN and ENGLISH
(Rept-316-F) Avail: NTIS HC $4.25

Ionospheric characteristics are tabulated for the F2, F1, and E layers. Data are recorded for the minimum and maximum frequencies, transmission frequencies, and height. E.H.W.

N73-17508# Sao Paulo Univ. (Brazil).
THE IMPORTANCE OF GROUND TRUTH DATA BY REMOTE SENSING [IMPORTANCIA DOS DADOS DE VERDADE TERRESTRE NO SENSORIAMENTO REMOTO]
Roger M. Hoffer 1972 20 p refs In PORTUGUESE
(Rept-120371) Avail: NTIS HC $3.00

The importance of remote sensing in resources management is reviewed. The sensing technology, ground truth, surface data, types of measurements, and remote sensing equipment are discussed. Transl. by F.O.S.

N73-17509# Instituto y Observatorio Astronomico de Marina, San Fernando (Spain).
AERONAUTICAL ALMANAC, JANUARY - APRIL 1973 [ALMANAQUE AERONAUTICO, ENERO - ABRIL 1973]
1972 310 p In SPANISH
Avail: NTIS HC $17.50

The ephemerides for the stars, moon, sun, and planets are presented. The sideral angles for navigational stars, and interpolation tables for determining hour angles are included. Nightime sky diagrams are also included. Transl. by F.O.S.

N73-17510*# Tracor, Inc., Austin, Tex.
TRINITY BAY STUDY: DYE TRACING EXPERIMENTS

George H. Ward, Jr. Nov. 1972 132 p refs
(Contract NAS9-12724; TRACOR Proj. 077-021)
(NASA-CR-128734; T72-AU-9601-U) Avail: NTIS HC $8.75 CSCL 08C

An analysis of the heat balance and temperature distribution within Trinity Bay near Galveston, Texas is presented. The effects of tidal currents, wind driven circulations, and large volume inflows are examined. Emphasis is placed on the effects of turbulent diffusion and local shears in currents. The technique of dye tracing to determine the parameters characterizing dispersion is described. Aerial photographs and maps are provided to show the flow conditions existing at different times and seasons. Author

N73-17511*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PROVISIONAL HOURLY VALUES OF EQUATORIAL Dst FOR JULY, AUGUST, SEPTEMBER AND OCTOBER 1972
M. Sugiura and D. J. Poros (Computer Science Corp., Silver Spring, Md.) Jan. 1973 7 p refs
(NASA-TM-X-66174; X-645-73-18) Avail: NTIS HC $3.00 CSCL 04A

The tabulated hourly magnetic storm-time variation (Dst) values were obtained using the four Dst stations of Hermanus, Kakioka, Honolulu, and San Juan. The provisional Dst values for July, August, and September 1972 previously published by World Data Center A and Goddard Space Flight Center are superseded by these values. Author

N73-17512*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EMPIRICAL MODEL OF GLOBAL THERMOSPHERIC TEMPERATURE AND COMPOSITION BASED ON DATA FROM THE OGO-6 QUADRUPOLE MASS SPECTROMETER
A. E. Hedin, H. G. Mayr, C. A. Reber, N. W. Spencer, and G. R. Carignan (Mich. Univ., Ann Arbor) Dec. 1972 66 p refs Submitted for publication
(NASA-TM-X-66183; X-621-73-37) Avail: NTIS HC $5.50 CSCL 04A

An empirical global model for magnetically quiet conditions has been derived from longitudinally averaged N2, O, and He densities by means of an expansion in spherical harmonics. The data were obtained by the OGO-6 neutral mass spectrometer and cover the altitude range 400 to 600 km for the period 27 June 1969 to 13 May 1971. The accuracy of the analytical description is of the order of the experimental error for He and O and about three times experimental error for N2, thus providing a reasonable overall representation of the satellite observations. Two model schemes are used: one representing densities extrapolated to 450 km and one representing densities extrapolated to 120 km with exospheric temperatures inferred from N2 densities. Using the best fit model parameters the global thermospheric structure is presented in the form of a number of contour plots. Author

N73-17513# Joint Publications Research Service, Arlington, Va.
HEAT SUPPLY DIAGRAMS FOR USSR CLIMATIC REGIONS
V. I. Brazhnikov 31 Jan. 1973 13 p refs Transl. into ENGLISH from Elektr. Stantsii (Moscow), no. 2, Feb. 1971 p 8-13
(JPRS-58114) Avail: NTIS HC $3.00

A study of heat supply requirements for the several U.S.S.R. climatic zones is presented. Geographical areas are defined with respect to mean monthly air temperature to show relative heating load. Diagrams of heat supply regimes from thermal electric power plants and from heating boiler plants are developed. Mathematical models of the heat requirement parameters are included. Author

N73-17514*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
REMOTE SENSING IN MICHIGAN FOR LAND RESOURCE MANAGEMENT Annual Report, 1972
I. J. Sattinger Dec. 1972 49 p refs Prepared in cooperation with Mich. State Univ. Original contains color illustrations
(Contract NSR-23-005-527)
(NASA-CR-130758; Rept-190800-2-F) Avail: NTIS HC $4.50 CSCL 08F

This project to demonstrate the application of earth resource survey technology to current problems in Michigan was undertaken jointly by the Environmental Research Institute of Michigan and Michigan State University. Remote sensing techniques were employed to advantage in providing management information for the Pointe Mouillee State Game Area and preparing an impact assessment in advance of the projected construction of the M-14 freeway from Ann Arbor to Plymouth, Michigan. The project also assisted the state government in its current effort to develop and implement a state-wide land management plan. Author

N73-17515*# Environmental Research Inst. of Michigan, Ann Arbor. Infrared and Optics Div.
REMOTE SENSING IN MICHIGAN FOR LAND RESOURCE MANAGEMENT: HIGHWAY IMPACT ASSESSMENT
Dec. 1972 118 p refs Prepared in cooperation with Michigan State Univ. and Michigan Dept. of State Highways
(Grant NSR-23-005-527)
(NASA-CR-130761; Rept-190800-1-T) Avail: NTIS HC $8.00 CSCL 08F

An existing section of M-14 freeway constructed in 1964 and a potential extension from Ann Arbor to Plymouth, Michigan provided an opportunity for investigating the potential uses of remote sensing techniques in providing projective information needed for assessing the impact of highway construction. Remote sensing data included multispectral scanner imagery and aerial photography. Only minor effects on vegetation, soils, and land use were found to have occurred in the existing corridor. Adverse changes expected to take place in the corridor proposed for extension of the freeway can be minimized by proper design of drainage ditches and attention to good construction practices. Remote sensing can be used to collect and present many types of data useful for highway impact assessment on land use, vegetation categories and species, soil properties and hydrologic characteristics. Author

N73-17516*# Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
LAND USE CLASSIFICATION UTILIZING REMOTE MULTISPECTRAL SCANNER DATA AND COMPUTER ANALYSIS TECHNIQUES
P. N. LeBlanc, C. J. Johannsen, and J. E. Yanner [1973] 109 p refs
(Grant NGL-15-005-112)
(NASA-CR-130759; LARS-111672) Avail: NTIS HC $7.50 CSCL 08M

An airborne multispectral scanner was used to collect the visible and reflective infrared data. A small subdivision near Lafayette, Indiana was selected as the test site for the urban land use study. Multispectral scanner data were collected over the subdivision on May 1, 1970 from an altitude of 915 meters. The data were collected in twelve wavelength bands from 0.40 to 1.00 micrometers by the scanner. The results indicated that computer analysis of multispectral data can be very accurate in classifying and estimating the natural and man-made materials that characterize land uses in an urban scene. Author

N73-17517*# Tennessee Univ., Knoxville.
APPLICATION OF REMOTE SENSING TECHNIQUES TO MEASUREMENT OF USE OF OUTDOOR RECREATION RESOURCES
Kerry F. Schell and Joe H. Taft Sep. 1972 114 p refs Sponsored in part by NASA
(Contract BOR-2-14-02-1)
(NASA-CR-130752; USGS-IR-NASA-256; PB-214638; USGS-DO-73-004) Avail: NTIS HC $7.75 CSCL 05K

This study attempts to determine if remote sensing techniques are available which would measure directly the number of individuals engaged in a specific outdoor recreation activity at a specific time. Airborne sensors received the most attention after initial study of satellite and high-altitude aircraft systems showed they offer no promise at this time for measuring recreation use. The DINADE-type system probably has more potential than any other system encountered, however, the development costs for this single purpose could be prohibitive. Efforts to improve ground-based methods such as time-lapse or activated photography could supply virtually constant monitoring, an attribute thus far not achieved. Author

N73-17518# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
THE AERONOMIC DISSOCIATION OF NITRIC OXIDE
S. Cieslik and Marcel Nicolet 18 Dec. 1973 45 p refs
(Grant NSF GA-33446X)
(PSU-IRL-SCI-407) Avail: NTIS HC $4.25

Atmospheric attenuation of the dissociation of nitric oxide in the mesosphere and stratosphere is studied. The nitric oxide dissociation profile depends on the absorption of the discrete Schumann-Runge bands of O2. The major contribution to the dissociation rate of NO is the predissociation of the delta(0 - 0) and delta(1 - 0) bands which can reach the stratosphere.
Author

N73-17519*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
SAMPLING FUNCTIONS FOR GEOPHYSICS
G. E. O. Giacaglia and C. A. Lunquist 3 Jul. 1972 100 p refs
(Grant NGR-09-015-002; Contract N00014-67-0013)
(NASA-CR-130745; SAO-Special-Rept-344; SAO-205-097) Avail: NTIS HC $7.00 CSCL 08E

A set of spherical sampling functions is defined such that they are related to spherical-harmonic functions in the same way that the sampling functions of information theory are related to sine and cosine functions. An orderly distribution of (N + 1) squared sampling points on a sphere is given, for which the (N + 1) squared spherical sampling functions span the same linear manifold as do the spherical-harmonic functions through degree N. The transformations between the spherical sampling functions and the spherical-harmonic functions are given by recurrence relations. The spherical sampling functions of two arguments are extended to three arguments and to nonspherical reference surfaces. Typical applications of this formalism to geophysical topics are sketched.
Author

N73-17520*# Kanner (Leo) Associates, Redwood City, Calif.
ISOTOPE COMPOSITION OF ELEMENTARY CARBON
A. V. Sidorenko, Yu. A. Borschevskiy, Sv. A. Sidorenko, V. A. Ustinov, and N. K. Popova Washington NASA Jan. 1973 9 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Geokhimiya (Moscow), v. 206, no. 2, 1972 p 463-466
(Contract NASw-2481)
(NASA-TT-F-14682) Avail: NTIS HC $3.00 CSCL 08G

The isotopic composition of the elementary carbon of the Precambrian was determined for graphitoid samples taken in various parts of the Soviet Union. Results of isotopic analysis indicate the predominantly biogenic nature of the graphitoids. A harder isotopic composition of the carbon in the graphitoids than that determined by isotopic criterion is explained by isotope exchange between organic matter and surrounding carbonates during regional metamorphosis. A regular increase in the C-12 isotope in graphite deposits as compared with surrounding gneisses was established. Isotopic investigations of graphitoids may be important in determining the gas and petroleum content of sedimentary-metamorphic strata.
Author

N73-17521# Los Alamos Scientific Lab., N.Mex.
EMP IN THE IONOSPHERE: ROCKET TEST 152-133
C. U. Benton, R. L. Wakefield, E. D. Niper, and R. L. Schellenbaum Sep. 1972 15 p refs
(Contract W-7405-eng-36)
(LA-4947) Avail: NTIS

The third in a series of rocket EMP experiments was conducted 30 October 1971 during the Barbizon exercise. The flight test of new instrumentation was primarily for the observation of the propagation characteristics of EMP-type signals at altitudes between 100 and 280 km. Two ground-based EMP simulators with close-in sensors, two ground-based ionosondes, a C-135 aircraft, and a 9-in. Nike-Tomahawk rocket were used to conduct the experiment. Development of instrumentation for this experiment, data from the experiment, and experiment planning are discussed.
Author (NSA)

N73-17522# Institut Royal Meteorologique de Belgique, Brussels.
OZONE OBSERVATIONS, OCTOBER - DECEMBER 1969 [OBSERVATIONS D'OZONE, 4E TRIMESTRE, 1969]
1972 51 p In FRENCH and FLEMISH
Avail: NTIS HC $4.75

The partial pressure of ozone and the ratio of mixing and temperature to standard levels in the atmosphere are presented. Using spectrophotometers, the total quality of ozone in the atmosphere for 1969 was measured. Results are given in ozonograms.
Transl. by E.H.W.

N73-17523# Centre National de la Recherche Scientifique, Paris (France). Lab. de Meteorologie Dynamique.
SCALE DEPENDENCE OF THE 200 mb DIVERGENCE INFERRED FROM EOLE DATA
Pierre Morel and Gustavo Necco 1972 57 p refs Sponsored by CNES
Avail: NTIS HC $5.00

The EOLE experiment with 480 constant volume balloons distributed over the Southern Hemisphere approximately at the 200 mb level, has provided a highly accurate set of tracer trajectories in the general westerly circulation. The trajectories of neighboring balloons were analyzed to estimate the horizontal divergence from the Lagrangian derivative of the area of one cluster. The variance of the divergence estimates results from two almost comparable effects: the true divergence of the horizontal flow, and eddy diffusion due to small scale two-dimensional turbulence. The RMS divergence is found to be of the order of .00001/sec and decreases logarithmically with the cluster size. This scale dependence is shown to be consistent with the quasi-geostrophic turbulence model of the general circulation in midlatitudes.
Author (ESRO)

N73-17524# Institut Royal Meteorologique de Belgique, Brussels.
IONOSPHERIC AND COSMIC RAY OBSERVATIONS Monthly Bulletin, Jun. 1972 [OBSERVATIONS IONOSPHERIQUES ET DU RAYONNEMENT COSMIQUE BULLETIN MENSUEL, JUIN 1972]
Jun. 1972 31 p refs In FRENCH and DUTCH
Avail: NTIS HC $3.75

Results of ionospheric and cosmic ray (neutron component) observations at Dourbes, Belgium are tabulated for June 1972.
ESRO

N73-17525# National Swedish Inst. for Building Research, Stockholm.
A SYSTEM OF DESCRIBING AND CLASSIFYING INFORMATION CONCERNING LAND FORMS
Sven G. Moller 1972 81 p
(PB-212774; D8:1972; ISBN-91-540-2041-7) Avail: NTIS HC $3.00; Svensk Byggtjanst, Box 1403, S-1-11 84, Stockholm, Sweden: Sw.Kr. 18 CSCL 08G

All planning of a landscape for some purpose such as community development of agriculture-forestry is preceded by and based on an inventory at three strata of the information relating to the landscape, physical geography, urban geography and present land use. The future land use is studied and laid down in the plan. The report contains an account of an outline system for the description and classification of the natural and the cultural landscape as a step in the formulation of a Swedish system of aerial photographic interpretation.
GRA

N73-17526# Teledyne Geotechnical, Alexandria, Va. Seismic Data Lab.
[RESEARCH PROGRESS IN SEISMIC ACTIVITIES RELATED TO NUCLEAR EXPLOSION AND EARTHQUAKE DETECTION AND IDENTIFICATION] Quarterly Technical Summary Report, Jul. - Sep. 1972
Robert R. Blandford 18 Oct. 1972 13 p refs
(Contract F33657-72-C-0009; ARPA Order 1714)
(AD-751243) Avail: NTIS CSCL 17/10

The report summarizes the work done by the SDL during the period July through September 1972, and primarily concerns the seismic research activities related to the detection and identification of nuclear explosions and earthquakes. The report also contains brief discussions of the support tasks and data services which were performed for other government contractors and for participants in the VELA-UNIFORM and PRIME ARGUS projects.
Author (GRA)

N73-17527*# Geological Survey, Washington, D.C. Topographic Div.

RESEARCH AND DEVELOPMENT IN TOPOGRAPHIC MAPPING Annual Report, Apr. 1971 - Apr. 1972
Apr. 1972 74 p refs Sponsored by NASA
(NASA-CR-130540; PB-210963; USGS-TD-72-003) Avail: NTIS HC $5.75 CSCL 08B

Research and development activities in the following areas are summarized: (1) cartography, (2) field surveys, (3) photogrammetry, (4) orthophotomapping, and (5) space technology. Author

N73-17528# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Aeronomy Lab.
ADVECTIVE HEATING IN THE THERMOSPHERE DURING GEOMAGNETIC STORMS Interim Report
Jeffrey M. Forbes 14 Sep. 1972 16 p refs
(AF Proj. 6690)
(AD-751921; AFCRL-72-0552; AFCRL-ERP-414) Avail: NTIS CSCL 04/1

A scale analysis is performed to estimate the meridional wind speeds necessary to effectively redistribute thermal energy by advection to lower latitudes during geomagnetic storms. Winds on the order of several hundreds of meters per second are found to account for a considerable amount of heat transfer in the thermosphere. Meridional winds of this magnitude during geomagnetic storms been reported by several workers. Author (GRA)

N73-17529# Aerospace Corp., El Segundo, Calif.
GENERALIZED FOURIER ANALYSIS OF GEOPHYSICAL DATA Technical Report, Jul. 1970 - Jul. 1971
Michael Schulz 30 Oct. 1972 20 p refs
(Contract F04701-72-C-0073)
(AD-751908; TR-0073(3260-20)-10; SAMSO-TR-72-261) Avail: NTIS CSCL 12/1

A method is reviewed whereby a set of data can be Fourier analyzed, even if the data points are unequally spaced in time (e.g., because of gaps in the coverage or randomly omitted data points). The method interprets Fourier analysis as a least-squares curve-fitting procedure, and thereby enables Fourier amplitudes, phases, and spectra to be computed under adverse circumstances. Author (GRA)

N73-17530# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
DISTRIBUTION OF THERMODYNAMIC PROPERTIES OF THE ATMOSPHERE BETWEEN 30 AND 80 km Environmental Research Papers
Allen E. Cole 10 Aug. 1972 36 p refs
(AF Proj. 8624)
(AD-751874; AFCRL-72-0477; AFCRL-ERP-409) Avail: NTIS CSCL 04/1

Recently acquired rocket observations from U.S. and U.S.S.R. stations in arctic and subarctic regions were used to expand and update information published on extreme temperature, pressure, and density between 30 and 80 km. A revised set of estimated worldwide extremes of temperature, pressure and density are provided, together with frequency distributions of observed temperatures and densities at levels between 30 and 80 km for latitudes 30, 45, 60 and 80 deg N during June-July and December-January. Distributions around the annual mean are given for 15 deg N. Author (GRA)

N73-17531# Army Electronics Command, Fort Monmouth, N.J.
FIELD TESTS OF A DEVICE FOR RAPID SHALLOW SUBSURFACE EXPLORATION TUNNEL DETECTION
Ronald F. Johnson Sep. 1972 18 p refs
(DA Proj. 1H6-62701-A-448)
(AD-752086; ECOM-4026) Avail: NTIS CSCL 17/10

A new device for locating underground obstacles and tunnels is described. Field tests of an experimental model of this device include measurements taken on soil which contained no obstacles, as well as data on ground containing a cased and an uncased tunnel. Favorable results obtained for both tunnels are compared to the data taken where no subsurface obstacles were present. Author (GRA)

N73-17532# Stanford Univ., Calif. Electronics Labs.
A SEARCH FOR IONOSPHERIC DISTURBANCES ASSOCIATED WITH Pc 1 MICROPULSATIONS Technical Report, Jan. 1971 - Mar. 1972
Bruce Dingle Mar. 1972 52 p refs
(Contract N00014-67-A-0112; Grant NSF GA-17486; ARPA Order 1733)
(AD-752062; SU-SEL-72-021; TR-3) Avail: NTIS CSCL 04/1

Hydromagnetic waves associated with Pc 1 geomagnetic micropulsations travelling the ionosphere should produce small ionospheric electron density fluctuations. A search was made for such fluctuations using a ground-based HF sounding technique, but none were detected. This result is discussed in terms of the maximum fluctuation amplitude expected and the limitations on experimental sensitivity. Author (GRA)

N73-17533# Stanford Univ., Calif. Electronics Labs.
GENERATION OF ARTIFICIAL GEOMAGNETIC MICROPULSATIONS WITH A LARGE GROUND-BASED CURRENT LOOP Technical Report, Jan. 1971 - 30 Jun. 1972
A. C. Fraser-Smith, Kenneth J. Harker, Robert T. Bly, Jr., and David M. Bubenik Jun. 1972 106 p refs
(Contract N00014-67-A-0112-0066; ARPA Order 1733)
(AD-752061; SU-SEL-72-023; TR-4) Avail: NTIS CSCL 04/1

The purpose of this study is to investigate and, if possible, establish the feasibility of producing artificial geomagnetic micropulsations by using a large horizontal current loop on the ground. Most natural micropulsations appear to be produced by hydromagnetic (hm) waves propagating in the ionosphere and/or the magnetosphere, and the term artificial micropulsations is used to mean artificially produced hm waves with propagation characteristics similar to those of the natural signals. The critical quantity in the generation process for the hm waves is to the amplitude of the magnetic field variation that can be produced in the ionospheric E-region by the ground-based loop. Currents are induced in the conducting earth beneath the loop whenever its current is varied, and these currents have a magnetic field opposing the magnetic field of the loop. If either the conductivity of the earth or the variation frequency is too high the field at E-region heights may be reduced to a level where negligible hm wave amplitudes are produced. The effect of these earth currents is calculated for an assumed single-layer earth and for a wide range of frequencies and earth conductivities. Author (GRA)

N73-17534# Scripps Institution of Oceanography, San Diego, Calif. Visibility Lab.
AIRBORNE AND GROUND-BASED MEASUREMENTS OF OPTICAL ATMOSPHERIC PROPERTIES IN CENTRAL NEW MEXICO
Seibert Q. Duntley, Richard W. Johnson, and Jacqueline I. Gordon Sep. 1972 226 p refs
(Contract F19628-70-C-0054; AF Proj. 7621)
(AD-751936; SIO-Ref-72-71; AFCRL-72-0461; SR-2) Avail: NTIS CSCL 04/1

The report presents atmospheric optical data collected in the daytime chiefly with airborne instruments during a field expedition to central New Mexico in the Fall of 1970. Results from six flights are presented. The data include irradiance, directional reflectance of terrain, total volume scattering coefficients, atmospheric beam transmittance, path radiance, and directional path reflectance. Data for sunlight and overcast conditions were derived for downward-looking paths of sight inclined at seven zenith angles (93, 95, 100, 105, 120, 150, and 180 degrees) from altitudes of 4500 meters above ground level and lower in four spectral regions, as follows: three narrow band optical filters with mean wavelengths of 478, 664, and 765 nanometers; and one broad band sensitivity representing the photopic response with a mean wavelength of 557 nanometers. Author (GRA)

N73-17535# Rome Air Development Center, Griffiss AFB, N.Y.
COMPUTER ANALYSIS OF MULTISPECTRAL IMAGE DENSITIES TO CLASSIFY LAND USES
James D. Turinetti, III Sep. 1972 163 p refs
(AD-752217; RADC-TR-72-237) Avail: NTIS CSCL 08/6

The paper discusses an investigation into the computerized analysis of the combined application of day and night thermal infrared imagery with color film; and day and night thermal infrared imagery with bands of multispectral imagery. This study looked at the pairing of: (1) Day and Night Thermal Infrared

(TIR); (2) Day and Night TIR with Color Infrared film; (3) Day and Night TIR with those channels of the Multispectral system which covered the same portion of the spectrum that is covered by Color film; (4) Day and Night TIR with those channels of the Multispectral system which covered the same portion of the spectrum that is covered on Color Infrared film; and (5) Day and Night TIR with all eight channels of the Multispectral system. The image densities for selected known landuse classes were processed through a Fortran program and used as a model for identifying sample targets of known landuse classes.
Author (GRA)

N73-17536# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass.
HARPER LAKE STUDIES. 1: AIRCRAFT AND GROUND MEASUREMENTS. 2: MICROMORPHOLOGY AND SURFACE PROPERTIES Environmental Research Papers
Thomas P. Rooney, James T. Neal (AF Acad.), and Stanley M. Needleman 15 Aug. 1972 42 p refs
(AF Proj. 8607)
(AD-752226; AFCRL-ERP-410; AFCRL-72-0478) Avail: NTIS CSCL 08/6

Photographic and infrared scanning surveys were made over Harper Lake, California, on three occasions during 1970 to evaluate the usefulness and limitations of aerial techniques for assessing ground conditions on dry lakebeds. The surficial geology of the lakebed was mapped and ground measurements were made for soil moisture, salt content, strength, and radiometric temperature. Infrared imagery in the wavelength region of from 1 to 5 micrometers is well-suited for detecting and mapping zones of soft or moist soils on playa surfaces, although spatial resolution is a limiting factor. The effects of surface soil conditions and micromorphological features on aircraft operations were also evaluated.
Author (GRA)

N73-17537# GCA Corp., Bedford, Mass. Technology Div.
IONOSPHERIC ELECTRIC-FIELD INSTRUMENT PROGRAM Final Report, 14 Jun. 1966 - 30 Jun. 1972
Gerard A. Pintal and Carl A. Accardo Oct. 1972 25 p
(Contract AF 19(628)-6132; AF Proj. 7601)
(AD-751926; GCA-TR-72-3-A) Avail: NTIS CSCL 04/1

The report describes a rocket-borne instrument designed and fabricated for the purpose of measuring ionospheric electric fields. The sensor consists of a pair of spherical aluminum spheres coated with Aquadag and mounted on insulators at the ends of deployable boom arms. The potential difference is measured by electronic circuitry contained in a cylindrical section of Nike-Tomahawk payload.
Author (GRA)

N73-17538# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
REDUCTION OF THE VALUES OF THE FORCE OF GRAVITY FROM THE EARTH RELIEF TO SOME EXTERNAL SURFACE
A. V. Chornyi Nov. 1972 10 p refs Transl. into ENGLISH from Dopov. Akad. Nauk Ukr. SSR, Ser. B (Kiev), no. 6, 1970 p 519-521
(AD-752235; DMAAC-TC-1862) Avail: NTIS CSCL 08/5

The paper is a brief report on the reduction of the values of the force of gravity from the earth relief to some external surface.
Author (GRA)

N73-17539# Grumman Aerospace Corp., Bethpage, N.Y.
OAO, A-2, (ORBITING ASTRONOMICAL OBSERVATORY A-2) MEASUREMENTS OF THE ULTRAVIOLET AIRGLOW Final Report, Mar. 1971 - Sep. 1972
Edward S. Fishburne, Donald L. Moyer, Charles R. Waters, and Barnett S. Green 30 Sep. 1972 72 p refs
(Contract F19628-71-C-0129; ARPA Order 1366; AF Proj. 8692)
(AD-752228; AFCRL-72-0318) Avail: NTIS CSCL 04/1

The term airglow is commonly used to describe nonthermal emissions not correlated with magnetic disturbances in the upper atmosphere. The study of this radiation provides information on the nature of the upper atmosphere, as well as clues to the physical processes occurring at very high altitudes. The authors undertook an investigation to measure the dark and sunlit earth using the photometers of the Orbiting Astronomical Observatory A-2. The first series of measurements were concerned with the magnitude of the emitted radiation. Experimental results tend to support the theory that dayglow in the 1300-1800A region is due primarily to photoelectron excitation of molecular nitrogen. The measurements obtained on the earth's limb represent the most complete coverage known to the authors.
Author (GRA)

N73-17540# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
TRIGONOMETRIC LEVELING AND GRAVIMETRIC SURVEY IN THE ANTARCTIC
G. E. Lazarev Jul. 1972 133 p refs Transl. into ENGLISH of the mono. "Trigonometricheskoe Nivelirovanie i Gravimetricheskie Issledovaniya v Antarktike" Moscow, Nauka, 1970 71 p
(AD-752232; DMAAC-TC-1842) Avail: NTIS CSCL 08/5

The report gives an account of results of methods for the determination of heights, by which gravimetric measurements in Antarctica are chiefly determined. The errors in the determination of heights by the barometric method can reach a considerable value (plus or minus 30 m). A high accuracy of determination of heights can be provided by trigonometric leveling (plus or minus 3 m). The results are given of a special investigation of the refraction coefficient, whose value varies from -0.1 during the day to -3.5 or more at night. Also the methods of gravimetric measurements on extensive itineraries are summarized. Some results are explained of the interpretation of gravimetric observations carried out on the Second and Sixth Soviet Antarctic Expeditions. A classification is given of the physical-geographic characteristics determining the conditions under which the astrogeodetic and gravimetric measurements were conducted.
Author (GRA)

N73-17541# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
ON THE CALCULATION OF GRAVITY ANOMALIES
A. V. Chornyi Oct. 1972 11 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. SSR, Ser. B. Geol., Geofiz., Khim. to Biol. (Kiev), no. 8, 1970 p 708-710
(AD-752234; DMAAC-TC-1861) Avail: NTIS CSCL 08/5

The paper discusses the calculations of gravity anomalies. It considered the question of the normal gravity field and almost harmonic gravity anomalies. The need for more accurate calculations in regard to anomalies, and the method of computing the anomalies more accurately are discussed.
Author (GRA)

N73-17542# Wyoming Univ., Laramie. Dept. of Geology.
CONFIDENCE INTERVALS FOR OCEAN WAVE SPECTRA
Leon E. Borgman Sep. 1972 10 p refs
(Contract DACW72-72-C-0001)
(AD-752135; RR-72-1) Avail: NTIS CSCL 08/3

The random nature of ocean wave records introduces statistical variability into the wave spectrum estimates based on these records. This may cause inaccuracy in subsequent calculations such as the prediction of the primary wave direction or the estimation of structural response. Confidence intervals on such estimates are needed to evaluate whether adequate estimate accuracy has been obtained. The chi-squared confidence interval commonly used for wave spectra is based on the assumption of a Gaussian sea surface. Its applicability for hurricane size waves has been open for question. Therefore, after a brief outline of the relevant statistical relations basic to the chi-squared procedure, wave data from Hurricane Carla is empirically analyzed and compared with the theoretical conclusions. A simulation procedure is used to proceed from the data to probability interval statements.
Author (GRA)

N73-17543# Science Resources Foundation, Watertown, Mass.
QUASI-SINUSOIDAL GEOMAGNETIC VARIATIONS AT GEOMAGNETIC MIDLATITUDE Final Report, 1 Apr. 1971 - 30 Jun. 1972
John H. Frey and William L. Fischer 31 Jul. 1972 61 p refs
(Contract F19628-71-C-0178; AF Proj. 8601)
(AD-752229; AFCRL-72-0465) Avail: NTIS CSCL 08/14

Three-component quasi-sinusoidal geomagnetic variations (micropulsations) at Concord, Massachusetts for a five month period have been reduced to hourly average amplitudes in six contiguous octave frequency bands covering the period range from 16 to 1024 seconds. Original high and low sensitivity data have been merged to accommodate the 70 db dynamic

range of the natural variations. The local time behavior and spectral characteristics of the variations are discussed. Results of various linear correlation analyses of the varying levels of magnetospheric excitation and to the origin and propagation of hydromagnetic waves in the period range covered are discussed. Author (GRA)

N73-17544# Naval Postgraduate School, Monterey, Calif.
DESCRIPTION OF A RADIATION PACKAGE FOR THE NAVAL POSTGRADUATE SCHOOL GENERAL CIRCULATION MODEL
Frank L. Martin 1 Dec. 1972 51 p refs
(AD-752475; NPS-51MR72121A) Avail: NTIS CSCL 04/1

A method has been devised for integrating the pressure-scaled water-vapor and CO2 absorber masses from the surface to the sigma - levels used for prediction in the Naval Postgraduate School primitive equation model. Using empirical expressions for atmospheric absorptivity, scattering-reflectivity, cloud-reflectivity and earth-surface reflectivity, the useful solar insolations absorbed at earth and in the key atmospheric layers above the earth have been formulated. The terrestrial cooling effect at earth and in these same key atmospheric layers has also been formulated using recently published emissivities for the joint effects of water vapor and CO2. As a result, the radiative heating (cooling) at key levels may be ascertained for input into the atmospheric thermodynamic equation. In addition, application of atmospheric boundary-layer modelling permits determination of the surface-layer turbulent transports (in the vertical) of sensible and latent heat at the earth's surface. Author (GRA)

N73-17545# Utah State Univ., Logan. Space Science Lab.
ARCAS ROCKET INSTRUMENTATION DEVELOPMENT FOR MESOSPHERIC MEASUREMENTS
Kay D. Baker and Glenn D. Allred Jun. 1972 73 p refs
(Contract F19628-70-C-0302; AF Proj. 7663)
(AD-752241; AFCRL-72-0472; SR-1) Avail: NTIS CSCL 04/1

The report describes the development and use of three payloads for studying prescribed mesospheric parameters using small, meteorological-type rockets as the probing vehicles. These payloads utilized new techniques to measure atomic oxygen, Lyman-alpha radiation, 1.27-micron radiation from O2(singlet Delta(g)), and nitric oxide within the mesospheric region. The program served as an extremely significant step in the development and evaluation of the new instruments and techniques. Each instrument's measurements, philosophy, design and result is presented. Author (GRA)

N73-17546# Naval Electronics Lab. Center, San Diego, Calif.
REMOTE SENSING OF THE LOWER ATMOSPHERE BY MEANS OF FM CW RADAR Research Report, Jan. 1970 - Apr. 1972
J. H. Richter and D. R. Jensen 26 Sep. 1972 76 p refs
(NELC Proj. M103; XR0080101)
(AD-752034; NELC-TR-1845) Avail: NTIS CSCL 04/1

The report provides a wide cross section of observations including atmospheric turbulence, wave motions, rain, and simultaneous radar and radiosonde soundings. The radar reveals with unprecedented detail the microstructural dynamical processes knowledge of which is necessary for the interpretation of radio propagation phenomena. Simultaneous radar and radiosonde soundings show excellent correlation between radar-detected scattering layers and directly measured gradients in the refractive index profile. Author (GRA)

N73-17547# Stanford Univ., Calif. Electronics Lab.
INDUCED ENHANCEMENT OF THE PLASMA LINE IN THE BACKSCATTER SPECTRUM BY IONOSPHERIC HEATING Technical Report, Jan. - Jun. 1972
Kenneth J. Harker Jun. 1972 16 p refs
(Contract N00014-67-A-0112-0066; ARPA Order 1733)
(AD-752060; SU-SEL-72-041; SU-IPR-484; TR-5) Avail: NTIS CSCL 04/1

Recent results from ionospheric modification experiments at the Arecibo Ionospheric Observatory show an enhanced plasma line temperature of approximately 4000K due to excitation of the ion-acoustic parametric instability. Recent theories on the saturation spectrum of the plasma waves excited in this experiment predict that the bulk of the wave energy is associated with waves propagating in a very narrow angular cone centered on the geomagnetic field. The intensity of the plasma waves responsible for the scattering, propagating parallel to the probing radar beam i.e. at 40 to the geomagnetic field, is orders of magnitude weaker than the intensity of the parallel propagating plasma waves. It is shown here that it is still sufficient to account for the experimental results. Author (GRA)

N73-17548# International Business Machines Corp., Gaithersburg, Md.
GLOBAL WEATHER MODELING WITH VECTOR SPHERICAL HARMONICS
Sven Kjorklund 11 Oct. 1972 127 p refs
(Contract DAHC04-72-C-0020; ARPA Order 2089)
(AD-752569; Rept-1) Avail: NTIS CSCL 04/2

The report presents the current status of work in the weather models, with a view toward climatological application. Vector Spherical Harmonics are reviewed in the context of solving partial differential equations in spherical coordinates. The basic equations governing global weather models are presented. Vector Spherical Harmonics are applied to these equations in spherical coordinates and it is shown how separation of variables is achieved in the sense that angular dependence is eliminated. Author (GRA)

N73-17549# Physikalisch-Meteorologisches Observatorium, Davos (Switzerland).
APPROXIMATE VALUES OF INTENSITY OF NATURAL ULTRAVIOLET RADIATION FOR DIFFERENT AMOUNTS OF ATMOSPHERIC OZONE Final Technical Report, Feb. 1971 - Feb. 1972
Paul Bener Jun. 1972 70 p refs
(Contract DAJA37-68-C-1017)
(AD-752115; E-1364) Avail: NTIS CSCL 04/1

The present report deals with the results of measurements and computations of ultraviolet sky, solar, and sun and sky (global) intensity for 15 wavelengths between lambda = 297.5 and 380 nm and for 12 values of total amount of atmospheric ozone covering the interval of 0.240 to 0.460 cm in increments of 0.020 cm. The variation of ultraviolet intensity in dependence on Northern Latitude and season and the influence of an assumed reduction of atmospheric ozone is examined. The variation of the short wavelength limit of the terrestrial solar spectrum is furthermore discussed. The results on ultraviolet intensity for selected values of ozone and solar altitude are presented in tables. Diagrams demonstrate the variation of global intensity in dependence on the principal parameters. The present data are based on the results of extensive measurements of ultraviolet sky intensity at Davos, Switzerland (1950 m a.s.l.), and completed by a theoretical computation of direct solar intensity for elevations of 0 to 5 km s.s.l. Author (GRA)

N73-17550# Gulf Radiation Technology, San Diego, Calif.
ELECTRONIC AND IONIC REACTIONS IN ATMOSPHERIC GASES Final Report
R. H. Neynaber, J. A. Rutherford, and D. A. Vroom Jul. 1972 118 p refs
(Contract DNA001-72-C-0254; DNA Proj. NWED-XAXH)
(AD-752582; Gulf-RT-A12209; DNA-2944F) Avail: NTIS CSCL 04/1

The effect of addition on internal energy to the ion or neutral reactant in an ion-neutral process has been investigated. Changes in the cross section for certain processes are reported and a change in the state of excitation of the final product can in some cases be postulated. The reactions between O(-) - N2, N(-) - N2, N(-) - O2, N2(-) - O2, and N2(-) - O were considered. Where the cross section was found to increase with addition of internal energy to either the ion or the neutral, an approach to near resonance was, in some cases, found to have occurred. In such cases one or the other of the product particles may be produced in an exicted state. When the internal energy change is small compared to the energy defect for the reaction, little or no change in the cross section was observed. Author (GRA)

N73-17551# Sparcom, Inc., Alexandria, Va.
PULSED NEON LASER BATHYMETRIC STUDIES USING SIMULATED DELAWARE BAY WATERS

G. D. Hickman, J. E. Hogg, and A. H. Ghovanlou Sep. 1972 87 p refs
(Contract N00014-71-C-0202)
(AD-752486; TR-1) Avail: NTIS CSCL 08/10

The measurements and calculations given in this report deal with the feasibility of deploying an airborne laser transmitter/receiver system to measure water depths in highly turbid water. A new technique is described for simulating natural turbidity conditions in the laboratory. The results of the study simulating conditions in Delaware Bay show that 15 attenuation lengths is the maximum depth of water that can be penetrated to yield detectable signals by an airborne neon laser/receiver system flying at an altitude of 500 meters. Author (GRA)

N73-17552*# Air Force Avionics Lab., Wright-Patterson AFB, Ohio.
LIGHTNING AND STATIC ELECTRICITY CONFERENCE
Dec. 1972 694 p refs Conf. held at Las Vegas, Nev., 12-15 Dec. 1972; sponsored by AFAL and SAE
(AD-752551; AFAL-TR-72-325) Avail: NTIS CSCL 01/2

The document contains the text of unclassified papers presented at the 1972 Conference on Lightning and Static Electricity, held 12-15 December 1972. The papers document the discussion of the theoretical aspects of both lightning and atmospheric electrification. In addition, the practical control of adverse effects is addressed relative to aerospace vehicles and installations. Sessions include fundamental aspects, missiles and spacecraft, aircraft, advanced composites, fuels, and lightning simulation. Author (GRA)

N73-17553# Defense Mapping Agency Aerospace Center, St. Louis, Mo. Technical Translation Branch.
CONSTRUCTION OF THE MAIN FUNDAMENTAL SOLUTION OF THE GRAVITY EQUATION
A. V. Chornyy Oct. 1972 10 p refs Transl. into ENGLISH from Dopovidi Akad. Nauk Ukr. SSR. Ser. B: Geol., Geofiz., Khim. Biol. (Kiev), no. 3, 1970 p 237-239
(AD-752233; DMAAC-TC-1860) Avail: NTIS CSCL 08/5

The paper is a brief report on the construction of the main fundamental solution of the gravity equation. Author (GRA)

N73-17096* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ALLEGED MERCURY DISCHARGE BY THE LEWIS RESEARCH CENTER
Louis Rosenbluum *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 249-259 (For availability see N73-17078 08-04)
CSCL 06F

N73-17936* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL EXPLORATION FROM HIGH ALTITUDE IMAGERY
Herbert W. Blodget *In its* Significant Accomplishments in Sci., 1971 1972 p 7-12 ref (For availability see N73-17934 08-34)
CSCL 08G

N73-17941* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC OZONE
Richard W. Stewart *In its* Significant Accomplishments in Sci., 1971 1972 p 34-36 ref (For availability see N73-17934 08-34)
CSCL 04A

N73-17945* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL HYDROGEN REPORT
Henry C. Brinton *In its* Significant Accomplishments in Sci., 1971 1972 p 52-57 refs (For availability see N73-17934 08-34)
CSCL 04A

N73-17946* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC CONTROL OF THE HIGH LATITUDE THERMOSPHERE
Alan E. Hedin *In its* Significant Accomplishments in Sci., 1971 1972 p 58-61 (For availability see N73-17934 08-34)
CSCL 04A

N73-17947* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW VIEW OF THE RING CURRENT
Masahisa Sugiura *In its* Significant Accomplishments in Sci., 1971 1972 p 62-66 refs (For availability see N73-17934 08-34)
CSCL 08N

N73-17948* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETOSPHERIC PLASMA TAIL
Joseph M. Grebowsky *In its* Significant Accomplishments in Sci., 1971 1972 p 67-70 (For availability see N73-17934 08-34)
CSCL 14N

N73-17949* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD OBSERVATIONS OF THE DAYSIDE POLAR CUSP
Donald H. Fairfield *In its* Significant Accomplishments in Sci., 1971 1972 p 71-74 ref (For availability see N73-17934 08-34)
CSCL 14N

N73-17950* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT PROBE MEASUREMENTS OF dc ELECTRIC FIELDS FROM IMP 1
Thomas L. Aggson *In its* Significant Accomplishments in Sci., 1971 1972 p 75-78 (For availability see N73-17934 08-34)
CSCL 14N

14 INSTRUMENTATION AND PHOTOGRAPHY

Includes design, installation, and testing of instrumentation systems; gyroscopes; measuring instruments and gages; recorders; transducers; aerial photography; and telescopes and cameras.

N73-17554 Arizona State Univ., Tempe.
A STUDY OF THE MOTION OF A GENERAL TWO GIMBALED GYROSCOPE HAVING A FLEXIBLE CIRCULAR ROTOR Ph.D. Thesis
Walter Edward Red 1972 190 p
Avail: Univ. Microfilms Order No. 72-15611

The effect of a flexible rotor on the response of a general two gimbaled gyroscope was investigated. The physical model considered is composed of two rigid, axisymmetric gimbals and an axisymmetric rotor having a rigid inner core rapidly attached to a flexible, annular, constant thickness plate which, at its outer boundary, is attached to a rim assumed to have infinite bending stiffness. Equations of motion are derived for a general state of motion imposed on the system. Three special cases are examined. In Case 1, the natural mode shapes and frequencies are determined for the out-of-plane free vibration of a rotor plate subjected to null gyroscopic motion. In Case 2, the natural mode shapes and frequencies are determined for the out-of-plane free vibration of the rotor plate subjected to a constant spin rate and zero precession and nutation. Case 3 considers the rotor plate subjected to a distributed inertial forcing function induced by a specified state of gyroscopic motion in which the rotor is spinning and precessing at constant rates at a fixed nutation angle.
Dissert. Abstr.

N73-17555*# Lockheed Missiles and Space Co., Huntsville, Ala.
THEORY OF ZONE RADIOMETRY
Richard C. Farmer and Beverly J. Audeh Jan. 1973 94 p refs

(Contract NAS8-28089)
(NASA-CR-124062; LMSC/HREC-D306101; HREC-8089-1) Avail: NTIS HC $6.75 CSCL 14B

A spectroscopic instrumentation system was developed which was used to measure temperature and concentration distributions in axisymmetric and two dimensional combusting flows. This measurement technique is known as zone radiometry. Author

N73-17556*# Texas Univ., Austin. Dept. of Electrical Engineering.
A PROPOSED MAGNETIC DIGITAL TEMPERATURE TRANSDUCER, VOLUME 1 Final Report
Theodore E. Collier, Dimiter I. Tchernev, and William H. Hartwig 30 Sep. 1972 79 p refs
(Grant NGL-44-012-043)
(NASA-CR-130762) Avail: NTIS HC $6.00 CSCL 14B

A study has been made of the feasibility of using the discontinuous permeability versus temperature characteristics of some magnetic materials for a digital temperature transducer and a thermally controlled ON-OFF switch. Simple logic converts the number of output pulse to a digital word recognizable by the system. Efforts have been concentrated on materials with Curie temperatures between 0 and 100 C. One compound has the composition Mn(5-x)Fe(x)Ge3 where the amount of iron determines the transition temperature. The other compound is Ni-Zn ferrite and has the compositon Ni(1-x)Zn(x)Fe(1.95)O4 where the nickel: zinc ratio determines the transition temperature. A detailed report of materials prepared is presented. Toroidal inductors of the material have been constructed and the change in inductance with temperature measured. In view of these initial measurements, it is felt that a transducer utilizing the permeability versus temperature characteristics of these materials has promise as a reliable and sensitive solid state digital temperature transducer. Author

N73-17557# Joint Publications Research Service, Arlington, Va.
MOTION STUDIES OF GYRO INSTRUMENTS AND GEOPOLAR MEASUREMENT ERROR
16 Jan. 1973 27 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Priborostr. (Leningrad), no. 10, 1972 p 81-99
(JPRS-57990) Avail: NTIS HC $3.50

Motion studies of gyroscopic instruments and geopolar measurement error are presented. The subjects discussed are: (1) errors in measuring angular orientation of a vehicle by means of a three-axis gyrostabilized platform considering drift, (2) the motion of a dynamically unbalanced linear acceleration gyrointegrator, (3) the motion of a gimbal-mounted gyro during rotor acceleration, and (4) the problem of determining the position of a vehicle in geopolar regions. For individual titles, see N73-17558 through N73-17561.

N73-17558 Joint Publications Research Service, Arlington, Va.
ERRORS IN MEASURING THE TURNING ANGLES OF A VEHICLE BY MEANS OF A THREE-AXIS GYROSTABILIZED PLATFORM CONSIDERING DRIFT c21
P. K. Plotnikov *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 1-7 refs (For availability see N73-17557 08-14)

The matrix method is used to obtain the exact formulas of the gimbal errors of a three-axis gyrostabilized platform where its drift in inertial space has a constant rate. An analytical solution is presented for the problem in the case where the angular rate of rotation of the stabilized platform in inertial space is constant and the movement of the vehicle is arbitrary. Author

N73-17559 Joint Publications Research Service, Arlington, Va.
MOTION OF A DYNAMICALLY UNBALANCED LINEAR ACCELERATION GYROINTEGRATOR
I. N. Petrov *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 8-13 refs (For availability see N73-17557 08-14)

A study was made of the motion of a gyroscopic linear acceleration integrator with a dynamically unbalanced inside frame and a nonaxially seated rotor. The parameters of the auto-oscillations and the drift of the instrument are defined. Author

N73-17560 Joint Publications Research Service, Arlington, Va.
MOTION OF A GIMBAL-MOUNTED GYROSCOPE DURING ROTOR ACCELERATION
M. A. Padlovskiy and L. M. Gelman *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 14-19 refs (For availability see N73-17557 08-14)

The behavior of a free gyroscope on a stationary base during rotor acceleration is discussed. Formulas are obtained which permit a numerical estimate of the deviation of the gyroscope from the given position and the unlocking delay time of the instrument excluding the indicated deviation. Author

N73-17561 Joint Publications Research Service, Arlington, Va.
PROBLEM OF RECKONING THE POSITION OF A VEHICLE IN GEOPOLAR REGIONS c21
K. G. Vakhitov *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 20-24 refs (For availability see N73-17557 08-14)

A study was made of the orthopolar coordinate system considering the ellipsoidal shape of the earth. The formulas for conversion of this system to the geographic system are derived. Author

N73-17562*# Panametrics, Inc., Waltham, Mass.
PROTOTYPE ULTRASONIC INSTRUMENT FOR QUANTITATIVE TESTING Final Report, Apr. 1971 - Jun. 1972
Lawrence C. Lynnworth, John L. DuBois, and Paul R. Kranz Jun. 1972 68 p refs Original contains color illustrations
(Contract NAS8-26931)
(NASA-CR-124021) Avail: NTIS HC $5.50 CSCL 14B

A prototype ultrasonic instrument has been designed and developed for quantitative testing. The complete delivered instrument consists of a pulser/receiver which plugs into a standard oscilloscope, an rf power amplifier, a standard decade oscillator, and a set of broadband transducers for typical use at 1, 2, 5 and 10 MHz. The system provides for its own calibration, and on the oscilloscope, presents a quantitative (digital) indication of time base and sensitivity scale factors and some measurement data. Author

N73-17563*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
STRAIN GAUGE AMBIGUITY SENSOR FOR SEGMENTED MIRROR ACTIVE OPTICAL SYSTEM Patent Application
Charles L. Wyman and Thomas L. Howe, inventors (to NASA) Filed 1 Feb. 1973 12 p
(NASA-Case-MFS-20506-1; US-Patent-Appl-SN-328792) Avail: NTIS HC $3.00 CSCL 14B

A strain gage ambiguity sensor for segmented mirror optical systems is described. The gage measures the alignment between adjacent surfaces of the mirror segments. Diagrams of the equipment are provided. The cantilevering structure for a photosensitive resistor and its use in the segmented mirror structure to measure the alignment is discussed. NASA

N73-17564*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
METHOD AND DEVICE FOR DETECTION OF SURFACE DISCONTINUITIES OR DEFECTS Patent Application
Lubert J. Leger, inventor (to NASA) Filed 24 Jan. 1973 22 p
(NASA-Case-MSC-14187-1; US-Patent-Appl-SN-326326) Avail: NTIS HC $3.25 CSCL 14B

A method for detecting cracks in a test article such as a porous subsurface matrix covered with an impervious coating is described. The method uses vapors from an entrapped penetrating fluid to interact with a sensitizing medium. The penetrating fluid is an organic compound which will vaporize rapidly and react with indicating medium. The method has been applied to the quality control of thermal protective systems. NASA

N73-17565# National Bureau of Standards, Boulder, Colo. Atomic Frequency and Time Standards Section.
THE GENERATION OF AN ACCURATE AND UNIFORM TIME SCALE WITH CALIBRATIONS AND PREDICTION
Kazuyuki Yoshimura Nov. 1972 63 p refs
(NBS-TN-626) Avail: SOD $0.60 as C 13.46:626

A predicted time interval or frequency of a single clock as a weighted sum of frequency data obtained by calibrations

against a primary standard is expressed. A matrix equation for the optimum weighting coefficients is derived. The matrix equation is solved to obtain the optimum filter response functions for white noise frequency modulation, flicker noise frequency modulation, and linear combinations of these. It is shown that the mean square time prediction error would increase as the elapsed time squared for the case without intermediate calibrations. Author

N73-17566*# Denver Research Inst., Colo. Industrial Economics Div.
APPLICATIONS OF AEROSPACE TECHNOLOGY IN INDUSTRY: A TECHNOLOGY TRANSFER PROFILE. VISUAL DISPLAY SYSTEMS
Dec. 1972 98 p refs
(Contract NASw-2362)
(NASA-CR-130634) Avail: NTIS HC $7.00 CSCL 14B

The growth of common as well as emerging visual display technologies are surveyed. The major inference is that contemporary society is rapidly growing evermore reliant on visual display for a variety of purposes. Because of its unique mission requirements, the National Aeronautics and Space Administration has contributed in an important and specific way to the growth of visual display technology. These contributions are characterized by the use of computer-driven visual displays to provide an enormous amount of information concisely, rapidly and accurately. Author

N73-17567*# Radio Corp. of America, Burlington, Mass. Aerospace Systems Div.
LASER ALTIMETER Final Report
[1972] 100 p refs
(Contract NAS9-10600)
(NASA-CR-128738; CR-72-588-001-L) Avail: NTIS HC $7.00 CSCL 14B

The development of a laser altimeter for use in the Apollo Lunar Orbital Experiments mission is discussed. The altimeter provides precise measurement of an Apollo vehicle above the lunar surface from an orbit of 40 to 80 nautical miles. The technical characteristics of the altimeter are described. Management of the altimeter development program is analyzed. Author

N73-17568# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
INFLUENCE OF SPACE RADIATIONS ON THE CACTUS ULTRASENSITIVE ACCELEROMETER
Jacques Tiffon Oct. 1972 56 p refs In FRENCH; ENGLISH summary
(ONERA-NT-200) Avail: NTIS HC $5.00

During the orbital flight of the D5-B satellite, which was devoted to the qualification of the Cactus ultrasensitive accelerometer, the electric charge gathered by the proof mass of this accelerometer under the influence of high energy radiations may perturb the operation of this instrument. A bibliographic study shows that this charge effect is mainly due to the protons and electrons of the Van Allen belts through which the D5-B satellite will fly. The various characteristics of the proton and electron interaction process with the matter lead to the separate study of the influence of these two kinds of particles on the level of the mass electric charge. Periodic discharges of this mass by contact are being considered. These results permit determination of the frequency of these discharges. Author

N73-17569# Danish Research Center for Applied Electronics, Hoersholm.
COMPACT POTENTIOMETERS: DIFFERENT ENVIRONMENTAL EFFECTS ON STABILITY OF 29 MANUFACTURES AND TYPES. INCLUDES CARBON-, CERMET-, AND WIRE-WOUND TYPES [TRIMMEPOTENTIOMETRE: UNDERSOGELSE AF 29 FABRIKATERS OG TYPERS STABILITET UNDER FORSKELLIGE MILJPOVIRKNINGER. OMFATTER TRADVIKLEDE, CERMET- OG KULTYPER]
A. Bjerre Nov. 1972 48 p In DANISH; ENGLISH summary
(ECR-30) Avail: NTIS HC $4.50

The characteristics of carbon, cermet, and wire-wound types of potentiometers are described. The stability qualities of the potentiometers when exposed to various environments are analyzed. Results of tests conducted on twenty nine potentiometers of different types and manufacture are presented. Diagrams and photographs of the test equipment used are included. Author

N73-17570# Cranfield Inst. of Technology (England). Coll. of Aeronautics.
A COMPARATIVE ASSESSMENT OF THREE METHODS OF MEASUREMENT OF PRESSURE ERROR CORRECTIONS
M. E. Eshelby Jun. 1972 25 p refs
(Cranfield-Aero-11) Avail: NTIS HC $3.25

Three methods of evaluating the pressure error of an aircraft pitot-static system are described, and the relative merits of each method are compared. The determination of static pressure error by a trailing cone is considered as a method suitable for use on light aircraft, and comparisons are made between the pressure error measured by the cone and other methods. Author

N73-17571*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
CURRENT TO A MOVING CYLINDRICAL ELECTROSTATIC PROBE
W. R. Hoegy and L. E. Wharton (Md. Univ., College Park) Dec. 1972 34 p refs Submitted for publication
(NASA-TM-X-66177; X-621-72-492) Avail: NTIS HC $3.75 CSCL 14B

The current collection characteristics of a moving cylindrical Langmuir probe are evaluated for a range of probe speeds and potentials which are applicable to earth and planeatry measurements. The current expressions derived include the cases of the general accelerated current, sheath area limited current, orbital motion limited current, and retarded current. For the orbital motion limited current, a simple algebraic expression is obtained which includes and generalizes the Mott-Smith and Langmuir expressions for both a stationary probe and a rapidly moving probe. For a rapidly moving probe a single formula adequately represents both the accelerated and the retarded current. Author

N73-17572*# Ohio State Univ., Columbus. Dept. of Geodetic Science.
AN INVESTIGATION INTO SOME PROBLEMS IN ANALYTICAL PROCESSING OF LUNAR ORBITER PHOTOGRAPHY Final Report
Sanjib K. Ghosh and Sebastian Ekenobi Feb. 1972 37 p refs
(Grant NGR-36-008-125; OSURF Proj. 2810)
(NASA-CR-128279; Rept-169) Avail: NTIS HC $4.00 CSCL 14E

Problems in analytical processing of lunar orbiter photography are discussed. The effects of image motion and image motion compensation on the location of the principal point are analyzed. The effect of the focal plane shutter on the distortion and interior geometry is examined. Real data is used to confirm the workability of a mathematical model and the use of a computer to calibrate spaceborne photographic imagery. Author

N73-17573*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
TEST REPORT: VIBRATION TESTING OF THE ELECTRON/PROTON SPECTROMETER STRUCTURAL TEST UNIT
D. L. Vincent Mar. 1972 42 p
(Contract NAS9-11373)
(NASA-CR-128699; EPS-361) Avail: NTIS HC $4.25 CSCL 14B

The structural test unit of the electron-proton spectrometer was tested to a random vibration spectra and to a sinusoidal resonant search to comply with the requirements of a verification plan for the spectrometer. The test item consisted of mass simulated electronic and printed circuit boards mounted in a flight type electronic housing. The arrangement, center of gravity, and weight were as proposed for flight units. Author

N73-17574*# Lockheed Electronics Co., Houston, Tex.
TEST REPORT: SHOCK TEST OF THE ELECTRON/PROTON SPECTROMETER STRUCTURAL TEST UNIT
D. L. Vincent [1972] 9 p ref Sponsored by NASA
(NASA-CR-128698; EPS-359) Avail: NTIS HC $3.00 CSCL 14B

A shock test of the electron-proton spectrometer structural

test unit was conducted. The purpose of the shock test was to verify the structural integrity of the electron-spectrometer design and to obtain data on the shock response of the electronics and electronic housing. The test equipment is described and typical shock response data are provided. Author

N73-17575*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
ELECTRON-PROTON SPECTROMETER DESIGN SUMMARY
Jun. 1972 147 p
(Contract NAS9-11373)
(NASA-CR-128702) Avail: NTIS HC $9.50 CSCL 14B

The electron-proton spectrometer (EPS) will be placed aboard the Skylab in order to provide data from which electron and proton radiation dose can be determined. The EPS has five sensors, each consisting of a shielded silicon detector. These provide four integral electron channels and five integral proton channels from which can be deduced four differential proton increments. Author

N73-17576*# Lockheed Electronics Co., Houston, Tex. Electron/Proton Spectrometer Program.
ELECTRON/PROTON SPECTROMETER CERTIFICATION DOCUMENTATION ANALYSES
P. Gleeson [1972] 458 p refs
(Contract NAS9-11373)
(NASA-CR-128705; EPS-779) Avail: NTIS HC $24.50 CSCL 14B

A compilation of analyses generated during the development of the electron-proton spectrometer for the Skylab program is presented. The data documents the analyses required by the electron-proton spectrometer verification plan. The verification plan was generated to satisfy the ancillary hardware requirements of the Apollo Applications program. The certification of the spectrometer requires that various tests, inspections, and analyses be documented, approved, and accepted by reliability and quality control personnel of the spectrometer development program. Author

N73-17577*# Lockheed Electronics Co., Houston, Tex.
DESIGN CERTIFICATION REVIEW ASSESSMENT REPORT. ELECTRON/PROTON SPECTROMETER
[1972] 96 p
(Contract NAS9-11373)
(NASA-CR-128704) Avail: NTIS HC $7.00 CSCL 14B

The characteristics of the electron-photon spectrometer developed for the Skylab program are presented. The spectrometer is externally mounted on the Skylab module complex and provides omnidirectional measurement of electrons and protons which result from solar flares or enhancement of the radiation belts. The data are applied to the determination of relative biological effectiveness factors as a safety factor for manned space flight. Author

N73-17578*# National Bureau of Standards, Washington, D.C. Inst. of Applied Technology.
STUDY OF PERFORMANCE CHARACTERISTICS OF NOBLE METAL THERMOCOUPLE MATERIALS TO 2000 C
P. Freeze, D. Thomas, S. Edelman, and J. Stern Aug. 1972 39 p refs
(NASA Order C-67546-B)
(NASA-CR-120990; NBSR-10-949) Avail: NTIS HC $4.00 CSCL 11F

Three performance characteristics of noble metal thermocouples in various environments are discussed. Catalytic effects cause significant errors when noble metal thermocouple materials are exposed to air containing unburned gases in temperature ranges from 25 C to 1500 C. The thermoelectric stability of the iridium 40 rhodium to iridium thermocouple system at 2000 C in an oxidizing medium is described. The effects of large and small temperature gradients on the accuracy and stability of temperature measurements are analyzed. Author

N73-17579# Joint Publications Research Service, Arlington, Va.
SHIPBOARD QUANTUM Z-MAGNETOMETER
G. V. Alekseyev, S. P. Bakalinskiy, and A. Ya. Rotshteyn 23 Jan. 1973 9 p refs Transl. into ENGLISH from Geomagn. Aeron. (Moscow), v. 12, no. 5, Sep. - Oct. 1972 p 913-917
(JPRS-58040) Avail: NTIS HC $3.00

The design and block diagram of the cesium Z-magnetometer used aboard the nonmagnetic schooner Zayra are described. The error in instrument adjustment, the recording apparatus, and the system for automatic compensation of the unmeasured component H are briefly treated. Author

N73-17580*# Lockheed Electronics Co., Houston, Tex. Aerospace Systems Div.
TEST REPORT: ELECTRON-PROTON SPECTROMETER QUALIFICATION TEST UNIT, QUALIFICATION TEST
D. L. Vincent Mar. 1972 619 p
(Contract NAS9-11373)
(NASA-CR-128703; LEC/EPS-695) Avail: NTIS HC $33.00 CSCL 14B

Qualification tests of the electron-proton spectrometer test unit are presented. The tests conducted were: (1) functional, (2) thermal/vacuum, (3) electromagnetic interference, (4) acoustic, (5) shock, (6) vibration, and (7) humidity. Results of each type of test are presented in the form of data sheets. Author

N73-17581*# Westinghouse Electric Corp., Baltimore, Md. Systems Development Div.
A MILLIMETER WAVE MIXER Final Report, Feb. - Aug. 1972
L. E. Dickens Aug. 1972 15 p refs
(Contract NAS8-28295)
(NASA-CR-124060) Avail: NTIS HC $3.00 CSCL 14B

The mixer consists of a small metallic wafer, in which are embedded the semiconductor diodes, the waveguide mount is used to couple the diode wafer to the signal circuit, an RF tuning element, and a 3 mm coaxial connector for the IF output terminal. The cross-sectional dimension is that of the waveguide flange (19 mm x 19 mm, 0.75' x 0.75'), the overall length is nominally 25 mm (1.0 inch). This component is to be used as a single-ended RF mixer with four replacement mixer diodes, operating in the three millimeter wavelength band. Author

N73-17582# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
MULTICHANNEL DIGITAL SPECTROMETER
M. Clement and P. Stevenin Apr. 1972 46 p refs In FRENCH; ENGLISH summary
(EUR-CEA-FC-641) Avail: AEC Depository Libraries

This multichannel digital spectrometer for measuring the ion temperature of the Circe 25-kW device utilizes the Doppler broadening effect undergone by the 4686A He(t) line. The extreme sensitivity required (due to the low luminosity of the plasma) led to the choice of a flexible digital electronics system (easily synchronized, capable of dealing with variable exposure times, and having a computerized output) for the acquisition of data and the output of results, and a Fabry-Perot interferometer system having 12 spectral channels. NSA

N73-17583# British Steel Corp., London (England). Physics Dept.
DEVELOPMENT OF A MICROWAVE GAUGE TO MEASURE THE THICKNESS OF HOT METAL PLATE (> 8 mm)
B. L. Dalton Aug. 1972 11 p refs
(PB-212210; BISRA-PH/54/71) Avail: NTIS HC $3.00 CSCL 14B

The report describes the development of a microwave gauge capable of measuring the thickness of hot metal products in an on-line environment. The report covers the evolutionary stages of the design from laboratory prototype to on-line prototype, discussing the difficulties and measurement problems which were solved and the accuracies obtained on-line. Author (GRA)

N73-17584*# Kentucky Univ., Lexington. Coll. of Engineering.
THE INTERNATIONAL SYSTEM OF UNITS (SI) AND WHAT IT INVOLVES, PROCEEDINGS
Jul. 1972 147 p refs Conf. held at Lexington, Ky., 27-29 Sep. 1972 Sponsored by NASA and Metric Assoc., Inc.
(NASA-CR-130534; PB-212232; UKY-TR-56-72-ME-13) Avail: NTIS HC $9.50 CSCL 14B

The major aspects of metrication are discussed. Representa-

tives from multinational corporations who have converted to metric units point out problems other industries may eliminate during the conversion. Cost of conversion is discussed. Other topics include: Fasteners in an SI environment; metric conversion of machine tools, tooling and gaging; legal and legislative implications of metrication; consumer conversion; educating for SI conversion; adoption progress in the United Kingdom; and many more. Arguments are also presented opposing compulsory conversion to metric units. Author (GRA)

N73-17585# Eastman Kodak Co., Rochester, N.Y. Kodak Apparatus Div.

PHOTOGRAPHIC WATER CONSERVATION AND RECLAMATION PROCESSES STUDY Final Report, Apr. 1971 - May 1972

James W. Gibson Wright-Patterson AFB, Ohio AFAL May 1972 92 p

(Contract F33615-71-C-1353; AF Proj. 7645)

(AD-752220; AFAL-TR-72-273) Avail: NTIS CSCL 14/5

The report describes the performance and achievements in a study of Photographic Water Conservation and Reclamation Processes. Described is a modified wash system to reduce wash water consumption by 95 percent to 99 percent on a KODAK VERSAMAT Film Processor, Model 11C-M. The film quality study supports the conclusion that levels of residual thiosulfate obtained with this modified wash system are acceptable for many tactical applications. The water quality studies described by this report lead to the conclusion that deleterious photographic effects for black-and-white processing are caused by high calcium hardness, sulfides and elemental sulfur, among those potential water contaminants studied. Author (GRA)

N73-17586# Aerospace Research Labs., Wright-Patterson AFB, Ohio.

DYNAMIC BALANCING OF A NONROLLING, STING SUPPORTED, WIND TUNNEL MODEL PERFORMING NONPLANAR MOTIONS

Kevin E. Yelmgren Jun. 1972 42 p refs

(AF Proj. 7064)

(AD-752208; ARL-72-0100) Avail: NTIS CSCL 14/2

Wind-off, bench tests on a wind tunnel model that had freedom to pitch, and yaw, but no freedom to roll indicated that the pitching and yawing motions were inertially coupled. An order of magnitude analysis showed that this coupling was due to the product of inertia term I sub yz. The inertially coupled equations of motion are solved, and a method is presented for determining the magnitude and sign of L sub yz from recordings of the model motion. The method used to dynamically balance the model is described, and experimental results are presented that verify this method. Author (GRA)

N73-17587# Hughes Research Labs., Malibu, Calif.

PROTOTYPE MOVING BASE GRAVITY GRADIOMETER

Charles B. Ames, Robert L. Forward, Philip M. LaHue, Robert W. Peterson, Adrian J. Robinson, and D. W. Rouse Aug. 1972 196 p refs

(Contract F19628-72-C-0222; ARPA Order 1838; AF Proj. 1838)

(AD-752231; AFCRL-72-0535; SATR-1) Avail: NTIS CSCL 08/5

The report covers the technical studies accomplished during the first six months to design and develop a prototype moving base gravity gradiometer. The scope of work is limited to establishing the instrument and system design parameters during the time period covered by this report. The report presents preliminary designs, and summarizes advantages and disadvantages for three sensor vibration isolation concepts: rotating floated spherical sensor, two-axis mechanical gimbal ring sensor mount, and two axis air pad gimbal mount. A summary of tentative sensor parameters is presented. The report presents in detail, a system error budget that indicates errors reflected at the individual sensor output as well as at the individual gradient tensor element. Derivations of sensor error mechanisms are presented. Errors due to rotational field effects, arm mass unbalance and magnetic field interactions are derived. Design concepts and parameters for the various subsystems are presented. Sensor arm mass and inertia balance are discussed as are estimates for the sensor translational and angular vibration environment. The spin bearing performance characteristics, error mechanism and requirements are presented. Lastly, efforts to find and select suitable materials are documented. Author (GRA)

N73-17588# Nucleonic Data Systems, Inc., Santa Ana, Calif.

A NUCLEONIC SENSOR FOR DETECTING METAL IN RECIRCULATING LUBRICATING OIL SYSTEMS Final Report

Michael C. Berton Sep. 1972 62 p refs

(Contract DAAJ02-71-C-0019; DA Proj. 1F1-62203-A-434)

(AD-752580; USAAMRDL-TR-72-38) Avail: NTIS CSCL 11/8

The purpose of this program was to develop a sensor capable of detecting metal particles of various sizes and/or metal in solution down to the level of 10 parts per million (ppm) weight concentration. The sensor was to be capable of detecting both magnetic and non-magnetic metals. With respect to possible application in airborne systems, the sensor was to have detection capability over the temperature range from ambient to 400F and was to be capable of withstanding vibratory environments. Author (GRA)

N73-17589# Army Missile Command, Redstone Arsenal, Ala. Ground Equipment and Materials Directorate.

ERROR ANALYSIS OF THE MODIFIED LIGTENBERG EXPERIMENTAL STRESS ANALYSIS METHOD

John A. Schaeffel, Jr., Kenneth R. Smith, and Jodson R. Griffin 18 Jul. 1972 132 p refs

(DA Proj. 1W0-621103-A-660)

(AD-752127; RL-TR-72-7) Avail: NTIS CSCL 14/2

Materials Testing has become a very expensive and time consuming procedure. To alleviate some of the expense, practical methods using the Ligtenberg Reflective Moire Technique have been developed to study plate curvatures produced by stress, strain, and static and dynamic loading. The procedure for using the Ligtenberg Reflective Moire Technique was greatly improved by Rieder and Ritter who used a partial mirror to reflect various grid patterns onto the plate. However, the partial mirror has several drawbacks which are the result of indices of refraction, nonparallelism, and thickness. These various operating characteristics result in a distorted view of the Moire fringes. The purpose of the report is to analyze the various experimental situations which are imposed on the partial mirror system and to suggest ways for correcting the various problems encountered. Author (GRA)

N73-17935* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SOIL MOISTURE MEASUREMENTS WITH MICROWAVE RADIOMETERS

Thomas J. Schmugge *In its* Significant Accomplishments in Sci., 1971 1972 p 3-6 Original contains color illustrations (For availability see N73-17934 08-34)

CSCL 08M

N73-17937* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ARCTIC ICE MEASUREMENTS WITH MICROWAVE RADIOMETERS

Per Gloersen *In its* Significant Accomplishments in Sci., 1971 1972 p 13-18 (For availability see N73-17934 08-34)

CSCL 08L

N73-17938* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

A MULTISPECTRAL METHOD OF DETERMINING SEA SURFACE TEMPERATURES

William E. Shenk *In its* Significant Accomplishments in Sci., 1971 1972 p 19-23 (For availability see N73-17934 08-34)

CSCL 08C

N73-17939* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

MEASUREMENTS OF OCEAN COLOR

Warren A. Hovis *In its* Significant Accomplishments in Sci., 1971 1972 p 24-29 (For availability see N73-17934 08-34)

CSCL 08J

N73-17940* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC WIND FIELDS DERIVED FROM NIMBUS OZONE MEASUREMENTS
Cuddapah Prabhakara *In its* Significant Accomplishments in Sci., 1971 1972 p 30-33 (For availability see N73-17934 08-34)
CSCL 04A

N73-17942* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERTICAL MOTIONS INFERRED FROM SATELLITE RADIOMETRY
Vincent V. Salomonson *In its* Significant Accomplishments in Sci., 1971 1972 p 37-41 (For availability see N73-17934 08-34)
CSCL 04B

N73-17943* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES WITH SATELLITE RADIOMETER DATA
Milton Halem *In its* Significant Accomplishments in Sci., 1971 1972 p 42-46 (For availability see N73-17934 08-34)
CSCL 04B

N73-17957* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS FROM THE GSFC OSO 7 SPECTROHELIOGRAM
Werner M. Neupert *In its* Significant Accomplishments in Sci., 1971 1972 p 111-116 (For availability see N73-17934 08-34)
CSCL 03B

15 MACHINE ELEMENTS AND PROCESSES

Includes bearings, seals, pumps, and other mechanical equipment; lubrication, friction, and wear; manufacturing processes and quality control; reliability; drafting; and materials fabrication, handling, and inspection.

N73-17590*# Pyronetics, Inc., Santa Fe Springs, Calif.
VALVE, NORMALLY OPEN, TITANIUM: PYRONETICS MODEL 1425 Final Report
Edward Avalos 2 Mar. 1972 45 p refs
(JPL-ES-565923)
(NASA-CR-130545; QC/R-6-050) Avail: NTIS HC $4.25 CSCL 13I

An operating test series was applied to two explosive actuated, normally open, titanium valves. There were no failures. Tests included: proof pressure and external leakage test, gross leak test, post actuation leakage test, and burst pressure test. J.A.M.

N73-17591*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DEVELOPMENT OF AUTOMATIC THROUGH-INSULATION WELDING FOR MICROELECTRIC INTERCONNECTIONS
J. C. Arnett 15 Dec. 1972 63 p refs
(Contract NAS7-100)
(NASA-CR-130751; JPL-TM-33-544) Avail: NTIS HC $5.25 CSCL 13H

The capability to automatically route, remove insulation from, and weld small-diameter solid conductor wire is presented. This would facilitate the economical small-quantity production of complex miniature electronic assemblies. An engineering model of equipment having this capability was developed and evaluated. Whereas early work in the use of welded magnet wire interconnections was concentrated on opposed electrode systems, and generally used heat to melt the wire insulation, the present method is based on a concentric electrode system and a wire feed system which splits the insulation by application of pressure prior to welding. The work deals with the design, fabrication, and evaluation testing of an improved version of this concentric electrode system. Two different approaches to feeding the wire to the concentric electrodes were investigated. It was concluded that the process is feasible for the interconnection of complex miniature electronic assemblies. Author

N73-17592*# Boeing Commercial Airplane Co., Seattle, Wash.
DEVELOPMENT AND TESTING OF IMPROVED POLYIMIDE ACTUATOR ROD SEALS AT HIGHER TEMPERATURES FOR USE IN ADVANCED AIRCRAFT HYDRAULIC SYSTEMS
E. D. Robinson, A. W. Waterman, and W. G. Nelson 28 Feb. 1972 39 p refs
(Contract NAS3-16733)
(NASA-CR-121124; D6-41114) Avail: NTIS HC $4.00 CSCL 11A

Polyimide second stage rod seals were evaluated to determine their suitability for application in advanced aircraft systems. The configurations of the seals are described. The conditions of the life cycle tests are provided. It was determined that external rod seal leakage was within prescribed limits and that the seals showed no signs of structural degradation. Author

N73-17593*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
STRUCTURE OF MOLYBDENUM DISULFIDE FILMS SPUTTERED ON SUBSTRATES AT VARIOUS TEMPERATURES
Talivaldis Spalvins Washington Mar. 1973 14 p refs
(NASA-TN-D-7170; E-7152) Avail: NTIS HC $3.00 CSCL 13H

Molybdenum disulfide films 300 to 400 A thick were rf sputtered on aluminum and nickel surfaces at elevated, ambient, and liquid nitrogen temperatures. Electron transmission micrographs and electron diffraction patterns were taken to determine the structural growth. These transmission micrographs revealed that sputtered MoS2 films at ambient and elevated temperatures (320 and 150 C) formed an irregular network of ridges. The electron diffraction patterns of these films showed relatively sharp diffraction rings, indicating crystallinity. The transmission micrographs of sputtered films at liquid nitrogen temperatures revealed a continuous featureless film. The electron diffraction patterns showed broad, diffused rings indicating an amorphous film. The transmission micrographs of a post-annealed (425 C) MoS2 film sputtered at liquid-nitrogen temperature revealed the tendency for ridge formation. Electron diffraction patterns also showed increased sharpness of the diffraction rings. Friction tests showed that MoS2 films deposited at ambient and elevated temperatures exhibited good lubricating properties. The MoS2 films deposited at cryogenic temperatures had no lubricating characteristics. Author

N73-17594# Bhabha Atomic Research Centre, Bombay (India).
MULTIPLE THIN FLIM VAPOUR DEPOSITION UNIT
R. P. Agarwala and A. K. Due 1972 11 p
(BARC-609) Avail: AEC Depository Libraries

The design and construction of a vacuum evaporation unit for thin films are described. The unit is capable of attaining a dynamic pressure of less than 0.00001 torr and incorporates a substrate holder assembly which allows, in one pumpdown, the deposition of six films of different predetermined thicknesses and at different substrate temperatures. The films can simultaneously be annealed in situ. A schematic diagram of the inner assembly is given. Author

N73-17595# Admiralty Surface Weapons Establishment, Portsmouth (England).
RELIABILITY AS A TOTAL CONCEPT
N. A. Walter Sep. 1972 38 p refs
(TR-72-38; BR-32519) Avail: NTIS HC $4.00

The basic concepts, principles, models and methods of reliability engineering are discussed and developed in the frequency, time and probability domains. The mathematical inter-relationships are considered and their implication to the Navy discussed. Brief mention is also made of the various prediction methods available to the reliability engineer. ESRO

N73-17596# Admiralty Surface Weapons Establishment, Portsmouth (England).
A VERSATILE METHOD OF PREDICTION FOR SYSTEM RELIABILITY
N. A. Walter Sep. 1972 52 p refs
(TR-72-39; BR-32518) Avail: NTIS HC $4.75

A versatile method of Monte Carlo simulation of very complex reliability systems using logic circuit analysis programs linked to

statistics programs is described. The method is useful for all forms of reliability and is not restricted merely to electronics. Maintainability, logic situations, spares provisioning, repair times can all be included without unduly increasing the complexity. No computer knowledge is needed nor is any statistical mathematical background necessary in order to use the system proposed. The method exploits the fact that a large number of engineers are already using logic simulation programs, and these programs themselves are being continually improved. By using the computer to convert reliability diagrams into logic diagrams and then simulating the logic together with a stochastic variable enables the system performance to be simulated under almost any conditions. Author (ESRO)

N73-17597# Defense Documentation Center, Alexandria, Va.
CHEMICAL MILLING Report Bibliography, Aug. 1957 - Jan. 1972
Nov. 1972 158 p refs
(AD-752050; DDC-TAS-72-60) Avail: NTIS CSCL 13/8

The report includes references on the capabilities and limitations of Chemical Milling Techniques, materials for which it is suitable, and the quality of the finished surfaces. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract Number and Report Number Indexes are provided. Author (GRA)

N73-17598# Catholic Univ. of America, Washington, D.C. Dept. of Civil and Mechanical Engineering.
TORSION OF A FLUTED BAR WITH A ROPE-LIKE CROSS-SECTION
Samuel R. Heller, Jr., Michael Chi, and Guillermo Ome 1972 28 p refs
(Contract N00024-72-C-5394)
AD-752059; Rept-72-10) Avail: NTIS CSCL 13/9

The complex variable method of solving two-dimensional problems in elasticity is used. A mapping function suitable for any basically circular outline with an integral number of external or internal lobes periodically spaced around its periphery is developed. An adequate method for evaluating the coefficients is demonstrated and coefficient values are tabulated. Expressions for the torsional constant, warping function, and shearing stress are developed and their variation with the number of strands are displayed. Author (GRA)

N73-17599# United Aircraft Corp., East Hartford, Conn. Research Labs.
SPUTTERED THIN FILM RESEARCH Semiannual Technical Report, 15 Apr. - 15 Oct. 1972
Alexander J. Shuskus, Daniel J. Quinn, and Edward L. Paradis 27 Nov. 1972 57 p refs
(Contract N00014-72-C-0415; ARPA Order 2173)
(AD-752081; L951337-3) Avail: NTIS CSCL 13/8

The deposition of aluminum nitride was studied by comparing results obtained by reactive rf sputtering in nitrogen and ammonia ambients. Physical and optical properties of the films were measured. Charge storage characteristics of MIS capacitors employing a composite insulator structure of SrTiO3-SiO2 were studied. The strontium titanate was deposited by rf sputtering. Field effect transistors using SrTiO3-SiO2 gate insulation were fabricated and evaluated. Author (GRA)

N73-17600# Naval Air Engineering Center, Philadelphia, Pa. Engineering Dept.
THE ROLE OF ENERGY DISSIPATION IN DRAWN WIRE FATIGUE
Robert Black 1 Nov. 1972 74 p refs
(AD-752017; NAEC-ENG-7729) Avail: NTIS CSCL 13/9

The elastic-plastic solution for a circular cylinder subjected to static-tension and variable torsion is deduced for a material exhibiting a second order polynomial stress-strain relation. Strain energy loops were calculated and the dissipative energies were equated to wire life for drawn XIP and XXIP wires. The usual log-log relations between life and effective stress, alternating strain and hysteresis strain energy were found to fit the data satisfactorily. The fatigue data was determined to be compatible with predicted values based on tensile test material properties for the XIP wires, but not for the XXIP wires. Author (GRA)

N73-17601# Stanford Research Inst., Menlo Park, Calif.
A STUDY OF ADVANCED MECHANIZATION Final Report
Charles A. Rosen Nov. 1972 42 p refs
(Contract N00014-72-C-0390; SRI Proj. 1929)
(AD-752464) Avail: NTIS CSCL 13/8

The report presents the results of a survey of an important segment of computer-based automation; namely, that dealing with machines that can perform useful material-handling, assembly, and quality control tasks without continuous human sensing, manipulation, and control. The intent has been to assess the implications for industrial and military application, the limitations of available machines, and to recommend developments required to satisfy identified needs. Author (GRA)

N73-17602# Battelle Columbus Labs., Ohio.
MECHANICS OF CLOSED-DIE FORGING, PHASE 2 Final Report, 22 Mar. 1971 - 21 Sep. 1972
James R. Douglas and Taylan Altan Nov. 1972 128 p refs
(Contract DAAG46-71-C-0095; DA Proj. 6062)
(AD-752588; AMMRC-CTR-72-25) Avail: NTIS CSCL 13/8

The report represents the results of work completed under this manufacturing improvement program. The program covered the following specific areas: (a) flow stresses of metals, (b) instrumentation of forging presses, (c) evaluation and comparison of screw presses and mechanical presses for forging, (d) uniform compression tests and ring tests for determining the flow stress of metals, and (e) methods for predicting and measuring forging load under production conditions. It is expected that the information developed in this program will contribute to the improvement in the design and execution of forging operations. Author (GRA)

16 MASERS

Includes applications of masers and lasers. For basic research see: 26 Physics, Solid-State.

N73-17603# Technische Hochschule, Vienna (Austria). Inst. fuer Hochfrequenztechnik.
STUDIES ON OPTICAL COMMUNICATION TECHNOLOGY (LASER) Final Report, 1968 - 1972 and Annual Report, 1971 [UNTERSUCHUNGEN ZUR OPTISCHEN NACHRICHTENUEBERTRAGUNG (LASER)]
G. Koepf, W. Leeb, J. Riegl, and G. Schiffner 1 Feb. 1973 164 p refs In GERMAN
Avail: NTIS HC $10.25

Laser modulation by electro-optical mechanism, ultrasonic wave diffraction, absorption control in semiconductors, and Faraday polarization of certain crystals is reported. Internal and external modulation techniques with amplitude-, frequency-polarization- and directional-modulation on gas-, solid-, and semiconductor-lasers are discussed for mode locking and tune-out properties. The electronic control of a monofrequency carbon dioxide laser with constant output is obtained by changing part of the initial induction current into an electrical signal as standard for the resonance mirror. A current stabilized circuit is also developed for driving a helium cadmium laser. Transl. by G.G.

N73-17604*# Battelle Columbus Labs., Ohio.
INVESTIGATIVE STUDY OF HOLOGRAPHIC RECORDING MATERIALS DEVELOPMENT Final Report, 13 Apr. - 10 Nov. 1972
10 Nov. 1972 34 p refs
(Contract NAS1-11466)
(NASA-CR-112248) Avail: NTIS HC $3.75 CSCL 20E

The potential of certain cis-trans isomers and doped LiNbO3 for the holographic read/write/erase memory application was investigated. The cis-trans work involved the photochemical investigation of a number of potential materials as well as specific molecular engineering efforts on alpha-methyl stilbene and its derivatives. These efforts resulted in an increase in the change in index of refraction, and thereby, in potential recording utility, of an order of magnitude. The work on LiNbO3 was directed toward a preliminary investigation of the dynamics of the writing process. Several samples and a variety of writing conditions were investigated. An unexpected and as yet unexplained improvement

in material behavior with continued recycling was observed. In addition, some effort was devoted to an analysis of the physical conditions under which several current theories of the optical damage process are valid. Author

N73-17605# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
DETERMINATION OF THE ATTENUATION OF LASER BEAMS BY CLOUDS OF PARTICULATE MATTER
Kenneth G. Leib Jan. 1973 69 p refs Submitted for publication (RM-567) Avail: NTIS HC $5.50

The interaction between laser beams at several wavelengths and power levels, and flowing particulate clouds was experimentally investigated for gross attenuation and extinction. It was found that graphitic carbon and pumice provide the largest attenuative effect of the six different cloud materials tested. Graphitic carbon was examined in greater detail. The extinction coefficient was computed from the test results at high and low power measurements. From measurements of the index of refraction at two visible wavelengths (1.93 to 0.656i at 4880 A, 1.70 to 0.680i at 5145 A), the theoretical extinction coefficient was computed. The results, although consistent, show that nonlinear effects induced by high power significantly enter into laser beam-particulate cloud interaction mechanisms. Another beam-cloud interaction is the thermal lens effect. The effect was observed with Ca(OH)2 and the results reported upon in this report. Author

N73-17606*# Lockheed Missiles and Space Co., Sunnyvale, Calif. Manufacturing Research Investigation.
LASER HOLOGRAPHIC NONDESTRUCTIVE TESTING OF THE NASA X-248 ROCKET MOTOR Final Report
William J. Harris 28 Feb. 1973 112 p
(Contract NAS1-11419)
(NASA-CR-112225) Avail: NTIS HC $7.75 CSCL 20E

A program to apply holography for nondestructive testing of the X-248 rocket motor was undertaken. The objective was to establish the capability of holography in detecting known unbonding between liner and propellant. Holography was performed employing stressing techniques: (1) acoustical, (2) thermal, (3) radiative, and (4) static loading. Radiative stressing was successful in locating a large area of liner/propellant unbond. The results were correlated with destructive testing. Theoretical analysis provided an understanding of motor case holography in conjunction with radiative stressing. Author

N73-17607# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
APPLICATON OF MOLECULAR LASER TO THE STUDY OF EXCITED STATES POPULATIONS IN AN EXPANDING MIXTURE
Michele Thomas-Andraud Sep. 1972 66 p refs In FRENCH; ENGLISH summary
(ONERA-NT-204) Avail: NTIS HC $5.50

After a brief historical survey of the work done in France and abroad on molecular lasers, the principle of high pressure thermal laser is described: a pre-heated and compressed N2-CO2 mixture is quickly expanded in a supersonic nozzle, so as to obtain a population inversion of the CO2 (001) and CO2 (100) levels. The vibrational model chosen and the relaxation equations retained to represent the various energy exchanges taking place during expansion are discussed. A computer program was written in order to predict the results; the so-called time integration unsteady method used for expressing the evolution of the various flow parameters is briefly presented. Lastly, after describing the facility used and mentioning the advantages of its compression heater, the experimental results obtained in it are given. Author

N73-17608*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
FINITE APERTURE WAVEGUIDE LASER RESONATORS
John J. Degnan and Denis R. Hall Feb. 1973 32 p refs Submitted for publication
(NASA-TM-X-66186; X-524-73-47) Avail: NTIS HC $3.75 CSCL 20/5

A general theory of finite aperture waveguide laser resonators is developed which represents the external reflectors by matrices which couple linearly polarized waveguide modes having the same azimuthal symmetry. The theory allows the determination of resonator efficiency, resonator frequencies, and laser near and far field patterns. Computations of the coupling loss for the fundamental waveguide mode as a function of mirror curvature, separation, and aperture are in agreement with recent infinite aperture calculations in the limit of large apertures and indicate three low-loss configurations: large radius of curvature mirrors close to the guide; large radius of curvature mirrors centered at the guide entrance; and generally smaller curvature mirrors separated by half their curvature from the guide entrance. Design guidelines for construction of high efficiency CO2, CO and He-Ne waveguide laser resonators are summarized in tabular form. Author

N73-17609# California Univ., Livermore. Lawrence Livermore Lab.
ALIGNMENT CONTROL OF A HIGH ENERGY LASER SYSTEM
R. A. Higgins 27 Jul. 1972 6 p refs Presented at Natl. Electron. Conf., Chicago, 9-11 Oct. 1972 Sponsored by AEC
(UCRL-74050; Conf-721014-1) Avail: NTIS

A high energy laser system typically consists of a laser oscillator with several cascaded rod and disc amplifiers separated by beam expanders and disposed over distances of nearly 100 meters. In a dynamic environment very small displacements of these elements may contribute to the alignment error of the system. The relative importance of external sources of alignment error on portions of the optical system is evaluated to obtain the laser system output beam deviation angle as a function of element misalignments. One approach, which has been successful in maintaining mechanical stability to very close tolerances, termed the brute force method, locates the sources of deterministic errors and reduces them to acceptable levels. An alternate approach is the use of feedback control. Assuming that motion occurring in any critical element with respect to the target platform is measurable, then the resultant error voltage can be used to drive a position transducer which reduces the alignment error. Author

N73-17610# Douglas United Nuclear, Inc., Richland, Wash.
APPLICATIONS OF ULTRASONIC HOLOGRAPHY IN THE NUCLEAR INDUSTRY
Hans Toffer, R. W. Albrecht (Washington Univ., Seattle), and B. P. Hildebrand (Battelle-Northwest) Sep. 1972 26 p refs Presented at the 20th Remote Systems Technol. Conf., Idaho Falls, Idaho, 17 Sep. 1972
(Contract AT(45-1)-1857)
(DUN-SA-191; Conf-720903-14) Avail: NTIS

Developments in the use of sonic or ultrasonic holography in remote sensing, measuring, and information retrieval devices are reviewed. Information and discussions are included on ultrasonic holography, holography through metal slabs, specific applications of ultrasonic holography, imaging of wires, and anomalies in images. NSA

N73-17611# Cambridge Univ. (England). Dept. of Physical Chemistry.
KINETICS IMPORTANT TO THE DEVELOPMENT OF CHEMICAL LASERS Final Scientific Report, 1 Oct. 1970 - 31 Dec. 1971
J. R. Airey Jan. 1972 69 p refs
(Contract F44620-71-C-0063; AF Proj. 61102)
(AD-751930; AFCRL-72-0804) Avail: NTIS CSCL 20/5

An infrared chemiluminescence technique has been used to measure the rates of the following energy transfer reactions at 295 plus or minus 5K: (a) HF(v) + CO2 to HF(v - 1) + CO2 for v = 1,2,3,4,5; (b) DF(v) CO2 to DF(v - 1) + CO2 for v = 1,2,3,; (c) HF(v) + HF to HF(v - 1) + HF for v = 2,3,4,5,; ard (d) DF(v) + HG to DF(v - 1) + HF for v = 1,2. The rate constants for reactions (a), (b), (c), and (d) may be used in kinetic model analyses of hydrogen fluoride and related lasers. A very brief discussion is given of new aspects of the chemistry of excited states important to the development of chemical lasers. Author (GRA)

N73-17612# Defense Documentation Center, Alexandria, Va.
LASER COMMUNICATION SYSTEMS Report Bibliography, Aug. 1961 - Jan. 1972

Nov. 1972 249 p refs Supersedes DDC-TAS-70-56
(AD-751900; DDC-TAS-72-53; DDC-TAS-70-56) Avail: NTIS CSCL 17/2

The bibliography is a selection of references to unclassified and unlimited reports which were processed into the AD data bank from January 1953 through March 1972. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number indexes are included.

Author (GRA)

N73-17613# Hughes Research Labs., Malibu, Calif.
DAMAGE THRESHOLD STUDIES IN LASER CRYSTALS Final Technical Report, 16 Jun. 1969 - 15 Jun. 1972
Concetto R. Giuliano, Donald F. DeBois, Robert W. Hellwarth, LaVerne D. Hess, and Gerald R. Rickel Sep. 1972 126 p refs
(Contract F19628-69-C-0277; ARPA Order 1434; AF Proj. 8693)
(AD-751928; AFCRL-72-0485) Avail: NTIS CSCL 20/5

The report contains a cumulative summation of a three-year experimental and theoretical program on laser induced damage in ruby and sapphire at 6943 A. Both bulk and surface damage were studied, using a well-characterized single transverse and longitudinal mode Q-switched ruby laser and amplifier. Temporal studies of the development of internal damage tracks using a high speed streak camera have been correlated with self-focusing theory with good agreement and constitute the first direct evidence for moving self-foci in solids. It has been found that beams with elliptical spatial cross-sections have higher self-focusing thresholds than circular beams. An investigation into the relation between surface damage and surface plasmas is described. Theoretical efforts have developed a new model for optical breakdown in materials based on a transfer of optical energy to photoelectrons which undergo rapid energy transfer to acoustic phonons via optical phonons. GRA

N73-17614# United Aircraft Corp., East Hartford, Conn.
DEVELOPMENT AND DELIVERY OF A STABLE MASTER OSCILLATOR Final Technical Report
M. L. Skolnick and C. J. Buczek Griffiss AFB, N. Y. RADC Oct. 1972 40 p refs
(Contract F30602-72-C-0147; ARPA Order 1279)
(AD-752219; RADC-TR-72-264) Avail: NTIS CSCL 20/5

The report discusses the technical background, design features, hardware, and performance of the stable master oscillator (STAMO)CO2 Laser System developed under the contract. This laser which operates with a high degree of frequency stability at a power level of 35 watts has been tailored for use as the driver laser for the high-power laser amplifier at the Rome Air Development Center Floyd Facility. The STAMO configuration uses a low-power master oscillator to injection lock a high-power ring oscillator. This configuration achieves the high degree of short-term frequency stability inherent in the small low-power master oscillator at the 35 watt power level. A feedback control loop is used with a hybrid injection-locking technique to achieve reliable long-term closed-loop operation of the system. Heterodyne measurements of the frequency stability of the STAMO have been made and its stability is shown to exceed the design requirements. Author (GRA)

N73-17615# United Aircraft Corp., East Hartford, Conn.
E-BEAM HCl LASER Semiannual Technical Report, 24 Apr. - 31 Oct. 1972
Barry R. Bronfin, John A. Shirley, William L. Nighan, and Thomas L. Churchill 30 Nov. 1972 23 p refs
(Contract N00014-72-C-0450)
(AD-752631; UARL-L911340-3) Avail: NTIS CSCL 20/5

The feasibility of producing stimulated emission in the 3-5 micrometer wavelength band by exciting hydrogen chloride vibrational levels by electron impact is being investigated theoretically and experimentally. A self-consistent set of electron-HCl cross sections for elastic, rotational, vibrational, and electronic processes were determined. Cross sections for vibrational excitation are found to be particularly large, over a relatively broad range of discharge conditions. No data has been obtained from the fully integrated HCl discharge experiments, as yet. Author (GRA)

N73-17616# Technology, Inc., Dayton, Ohio.
LIQUID CRYSTAL DISPLAYS FOR THE EVALUATION OF CO2 LASERS Final Report, Dec. 1971 - May 1972
H. J. Stocker Wright-Patterson AFB, Ohio ARL May 1972 26 p
(Contract F33615-71-C-1483; AF Proj. 7885)
(AD-752201; ARL-72-0081) Avail: NTIS CSCL 09/5

Experimental thin membrane type displays of cholesteric liquid crystals for the display of infrared laser beams have been developed. Both experiment and theoretical analysis demonstrates that there is a trade-off between rise time, decay time, resolution and sensitivity, with membrane thickness and surface cooling the principal limiting parameters. A new type of display in which the liquid crystal is deposited on a semiinfinite block of material shows promise as a suitable display for applications in which the incident power is a few watts/sq cm or larger.

Author (GRA)

N73-17617# Massachusetts Inst. of Tech., Cambridge. Center for Materials Science and Engineering.
RESEARCH ON MATERIALS FOR HIGH POWER LASER WINDOWS Quarterly Technical Report, 1 Aug. - 31 Oct. 1972
N. J. Grant, W. A. Backofen, H. K. Bowen, R. L. Coble, and F. A. McClintock 15 Nov. 1972 34 p refs
(Contract F19628-72-C-0304; ARPA Order 2055)
(AD-752193; QTR-2) Avail: NTIS CSCL 20/5

The mechanical properties of polycrystalline alkali halides have been investigated. The effects of texture, surface preparation, and coatings have been shown to significantly effect the stress-strain characteristics; samples with strengths over 5000 psi and with considerable ductility have been prepared. The plane strain fracture toughness has been measured and indicated a factor of 3.5 improvement in the resistance of crack propagation. The K(IC) values for polycrystalline KCl were 943 psi. in. to 1/2 power compared to 272 psi. in. to 1/2 power for the single crystal. Flaw detection, fractography, and laser damage studies have also been initiated. Studies of thin film coatings of Ge, MgF2, and NaF on polycrystalline KCl have continued. Double salt crystals of barium chloride-potassium chloride were grown for optical absorption measurements. The IR absorption edge occurs at 14 micrometers. Author (GRA)

N73-17618# ARO, Inc., Arnold Air Force Station, Tenn.
DUST PARTICLE VELOCITY MEASUREMENTS USING A LASER VELOCIMETER Final Report, Nov. 1971 - Feb. 1972
V. A. Cline, Jr. AEDC Dec. 1972 39 p refs
(Contract F40600-73-C-0004)
(AD-752225; ARO-OMD-TR-72-136; AEDC-TR-72-159) Avail: NTIS CSCL 14/2

The report describes the use of a one-component dual-scatter laser velocimeter (LV), in the forward-scatter mode, to measure the particle velocity distribution in a hypersonic dust erosion facility. The data acquired from a number of experiments are briefly summarized. Additional data acquired from holographic and fiber-optics measurements are also compared with the LV data. A discussion of the effects of both periodic and nonperiodic electrical noise upon the data is presented. Author (GRA)

N73-17619# Stanford Research Inst., Menlo Park, Calif.
MOLECULAR METAL LASER Semiannual Technical Report, 15 Apr. - 31 Oct. 1972
Donald C. Lorents, Robert M. Hill, and Donald J. Eckstrom 27 Nov. 1972 61 p refs
(Contract N00014-72-C-0478; ARPA Order 1807; SRI Proj. PYU-1925)
(AD-752465; SATR-1) Avail: NTIS CSCL 07/4

The report describes theoretical and experimental research to determine the feasibility of an electron beam excited high-pressure Hg dissociation laser operating on the excimer continuum band. A model of the excitation recombination, and molecular formation processes is presented. Experimental observations of the spectra in the 1-10 atm pressure range are presented, together with time decay studies of the continuum band. Author (GRA)

N73-17620# Oregon Graduate Center for Study and Research, Beaverton.

PROPAGATION OF MULTIWAVELENGTH LASER RADIATION THROUGH ATMOSPHERIC TURBULENCE Quarterly Report, 15 Jun. - 15 Sep. 1972
J. Richard Kerr Griffiss AFB, N. Y. RADC 15 Oct. 1972 28 p refs
(Contract F30602-72-C-0470; ARPA Order 1279)
AD-752565; Rept-1174-1; RADC-TR-72-288) Avail: NTIS CSCL 20/5

The program represents a continuation of a comprehensive experimental investigation of laser beam scintillations due to atmospheric turbulence. The report summarizes the efforts that are underway on three aspects of the problem: (1) multiwavelength scintillations over a long horizontal path, (2) turbulence intermittency effects, and (3) transmitter-aperture effects including the cancellation of atmospherically-induced beam wander. The long-path horizontal measurements are expected to clarify the behavior of beam statistics at very high levels of integrated-path turbulence. The effects of fundamental turbulence intermittencies on data spread, confidence limits, and propagation analyses are postulated to be much more significant than generally realized. The cancellation of atmospherically-induced beam wander and the clarification of predictions from a recent theory of reciprocity for a turbulent path are of potentially great practical importance in the design of laser illumination systems. Author (GRA)

N73-17621# Georgetown Univ., Washington, D.C. Dept. of Physics.
LASER TECHNOLOGY - LASER FREQUENCY - MOLECULAR AND SUPERCONDUCTING LASERS Final Report, Sep. 1969 - Aug. 1972
William J. Thaler Sep. 1972 34 p refs
(Contract F44620-68-C-0017; AF Proj. 7921)
(AD-752633; AFOSR-72-2000TR) Avail: NTIS CSCL 20/5

Research under the Project THEMIS program was conducted in four areas of laser technology: Laser frequency modulation; Molecular lasers; Superconducting lasers; Laser induced instabilities in fluids. A resume of the research results in each area is described. GRA

N73-17622# Owens-Illinois, Inc., Toledo, Ohio. Consumer and Technical Products Div.
DAMAGE THRESHOLD STUDIES OF GLASS LASER MATERIALS Final Technical Report
N. L. Boling, M. D. Crisp, G. Dube, L. Spanoudis, and P. R. Wengert 30 Jun. 1972 70 p refs
(Contract DAHC15-69-C-0303; ARPA Order 1441)
(AD-752549) Avail: NTIS CSCL 20/5

A summary of recent investigations of surface damage of transparent dielectrics is presented. For 30 nsec pulses at normal incidence, exit surface damage thresholds are typically 100 j/sq cm for ED-2 laser glass. Asymmetry between the entrance and exit surface damage thresholds is explained by considering electric field strengths at the surfaces. The morphology of surface damage is described and a model based upon reflections from the laser induced plasma is proposed. The problem of Platinum inclusions is not completely solved. Careful attention to the melting procedure has produced glass capable of withstanding energy densities much higher than the 10-20 j/sq cm (30 nsec) limit of several years ago. Continuation of this approach holds promise of completely eliminating Platinum inclusions from laser glass. Author (GRA)

N73-17623# Avco-Everett Research Lab., Everett, Mass.
CARBON MONOXIDE LASER Semiannual Technical Report, 1 Nov. 1971 - 30 Dec. 1972
Robert E. Center Jul. 1972 31 p refs
(Contract N00014-72-C-0030; ARPA Order 1807)
(AD-752818) Avail: NTIS CSCL 20/5

The main objective of the program is the investigation of pulsed electrical CO lasers to determine their potential scaling to large scale, high power operation. The following areas of investigation are included in the current contract: Investigation of the electron beam current requirements and the E/p range for sustainer discharge excitation of CO and CO/N2 mixtures; Design and construction of the electron gun and laser cavity for operation at gas temperatures from 100K to 300K; Experimental investigation of the multiline/multimode operation over a range of gas temperature and pressure up to the equivalent of one atmosphere at room temperature; The extension of the theoretical model to the directly excited CO laser including calculations of the transient gain and power. GRA

17 MATERIALS, METALLIC

Includes cermets; corrosion; physical and mechanical properties of materials; metallurgy; and applications as structural materials. For basic research see: 06 Chemistry. For related information see also: 18 Materials, Nonmetallic; and 32 Structural Mechanics.

N73-17624# Grumman Aerospace Corp., Bethpage, N.Y. Research Dept.
EFFECT OF MICROSTRUCTURE AND ENVIRONMENT ON STRESS CORROSION OF 7075 ALUMINUM ALLOY
G. Geschwind and P. N. Adler Jan. 1973 28 p refs Presented at Corrosion/'73, Anaheim, Calif., Mar. 1973
(RM-564J) Avail: NTIS HC $3.50

Grain boundary microstructure as well as the pH in a chloride ion solution environment was found to be significant to stress corrosion attack in 7075 aluminum alloys. The influence of these factors on both the initiation and propagation of cracking and the mode of attack in these alloys is described. Microstructural modifications to attain desirable stress corrosion resistance will be suggested. Author

N73-17625*# Westinghouse Electric Corp., Pittsburgh, Pa. Astronuclear Lab.
DEVELOPMENT OF ADVANCED HIGH STRENGTH TANTALUM BASE ALLOYS. PHASE 3: INFLUENCE OF METALLURGICAL CONDITION ON THE MECHANICAL PROPERTIES OF ASTAR-811C SHEET Final Report, Oct. 1967 - Jul. 1970
R. L. Ammon, R. W. Buckman, Jr., and D. L. Harrod Dec. 1972 88 p refs
(Contract NAS3-10939)
(NASA-CR-121096; WANL-M-FR-72-009) Avail: NTIS CSCL 11F

Metallurgical condition was shown to have a significant effect on the creep properties of ASTAR-811C (Ta-8W-1Re-0.7Hf-0.025C) sheet. Cold worked material exhibited creep rates 30 times higher than solution annealed material and 10 times greater than for recrystallized material. Both grain size and the carbide morphology changes as the final annealing temperature was raised from 3000 F to 3600 F. However, the lowest creep rates were achieved for material which retained the high temperature form of the Ta2C precipitate. Samples with GTA weldments had essentially identical properties as recrystallized base metal. Cooling rates from 3600 F of 5, 50, and 800 F deg/min. had little effect on the 2000 and 2400 F creep behavior of ASTAR-811C. Author

N73-17626# Technischen Universitaet, Munich (West Germany).
STUDIES ON MAGNETIC PROPERTIES OF DILUTED MAGNETIC ALLOYS Ph.D. Thesis [UNTERSUCHUNG MAGNETISCHER EIGENSCHAFTEN VON VERDUNTEN MAGNETISCHEN LEGIERUNGEN]
Juan Gonzalez Cabeza 1972 47 p refs In GERMAN
Avail: NTIS HC $4.50

An electron-impurity interchange model is used to analyze magnetic properties of diluted alloys at low temperatures. Outlined are electron-impurity spin compensation by correlation increase and by rapidly following spinflip processes at characteristic temperatures. Transl. by G.G.

N73-17627# Office National d'Etudes et de Recherches Aerospatiales, Paris (France).
ELECTRONIC STRUCTURE OF TRANSITION METALS AND THEIR ALLOYS
Francois Ducastelle Oct. 1972 149 p refs In FRENCH; ENGLISH summary
(ONERA-P-144) Avail: NTIS HC $9.50

Some physical properties of transition metals are studied, mainly those related to their cohesive properties. To this end, a method based on the calculation of the first moments of the

density of states within the tight binding approximation was used. This method provides semiquantitative results without performing any band calculations. It is applied in particular to the study of the cohesive energy, the relative stability of different crystalline structures and of the elastic moduli. The agreement with the experimental results is rather good, mainly with regard to the variation of the physical properties along a transition series. Also studied are disordered alloys of transition metals; more exactly some generalizations of the coherent potential approximation are derived. The behavior of the new approximations obtained in this way is examined in some limiting cases (dilute alloy; virtual crystal limit, atomic limit), which permits a comparison of these approximations. Some numerical results within a one dimensional model are also given. Author

N73-17628*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREEP-RUPTURE TESTS OF INTERNALLY PRESSURIZED INCONEL 702 TUBES
Klaus H. Gumto Washington Mar. 1973 21 p refs
(NASA-TM-X-2728; E-7235) Avail: NTIS HC $3.00 CSCL 11F

Seamless Inconel 702 tubes with 0.375-in. outside diameter and 0.025-in. wall thickness were tested to failure at temperatures from 1390 to 1575 F and internal helium pressures from 700 to 1800 psi. Lifetimes ranged from 29 to 1561 hr. The creep-rupture strength of the tubes was about 70 percent lower than that of sheet specimens. Larson-Miller correlations and photomicrographs of some specimens are presented. Author

N73-17629*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CREEP-RUPTURE TESTS OF INTERNALLY PRESSURIZED HASTELLOY-X TUBES
Klaus H. Gumto and Gary J. Colantino Washington Mar. 1973 23 p refs
(NASA-TM-X-2727; E-7234) Avail: NTIS HC $3.00 CSCL 11F

Seamless Hastelloy-X tubes with 0.375-in. outside diameter and 0.025-in. wall thickness were tested to failure at temperatures from 1400 to 1650 F and internal helium pressures from 800 to 1800 psi. Lifetimes ranged from 58 to 3600 hr. The creep-rupture strength of the tubes was from 20 to 40 percent lower than that of sheet specimens. Larson-Miller correlations and photomicrographs of some specimens are presented.
Author

N73-17630# Brown Univ., Providence, R.I. Div. of Engineering.
COMBINED MACROSCOPIC AND MICROSCOPIC APPROACH TO THE FRACTURE OF METALS Technical Progress Report, Jul. 1971 - Jun. 1972
J. Gurland, S. Burns, L. B. Freund, and J. R. Rice Jul. 1972 15 p refs
(Contract AT(11-1)-3084)
(COO-3084-10) Avail: NTIS

The hardness of carbon steels was investigated. It was proven theoretically and confirmed experimentally that the Brinell hardness and the diamond pyramid hardness correlate only if the Brinell hardness is determined at a particular value of the ratio of indentation diameter and indenter diameter, and the hardness correlates with the uniaxial flow stress at a strain of 7.5%. The hardness of the carbon steels can be represented as a function of grain size and particle spacing by a relation of Hall-Petch form. The Hall-Petch relation also applies empirically to the fatigue life of a spheroidized tool steel, evaluated as a function of particle spacing, in the very limited ranges of spacing and stress investigated. The effects of grain size on the dynamic fracture toughness, K(id), were measured on a mild steel. The analysis of the dynamics of crack propagation in double-cantilevered-beam specimens was attempted for loadings of constant force and constant bending moment. Author (NSA)

N73-17631# Kernforschungsanlage, Juelich (West Germany). Inst. fuer Reaktorbauelemente.
CATALOG OF MELTING BODIES OF METALLIC MATERIAL FOR THE DETERMINATION OF TEMPERATURES IN THE REGION FROM 30 TO 1555 C
Karl-Heinz Presser Jun. 1972 155 p refs In GERMAN; ENGLISH summary
(JUL-871-RB) Avail: AEC Depository Libraries

For the purpose of an indirect, approximate determination of temperatures in the region of 30 to 1555 C, 143 different melting bodies of metallic material, their constituents, and compositions are given. The size of the melting bodies varies between 1 mm and 10 mm. Suitable forms for the melting bodies are given. The melting bodies may only be applied in capsules, surrounded by a protecting atmosphere. The appropriate capsule material is quartz and aluminum oxide. Hydrogen is particularly appropriate as the protecting atmosphere. Also, for surfaces of melting bodies nearly free from metal impurifications, the empirically determined temperature of variation and the response sensitivity of miniature melting bodies is given in relation to the melting point or the melting interval. The reproducibility of the temperature of form variation was lower than + or - 2% in most cases. Author (NSA)

N73-17632# Oak Ridge National Lab., Tenn.
NEW PLATINUM-RHODIUM-TUNGSTEN ALLOYS FOR SPACE ISOTOPIC HEAT SOURCES
H. Inouye, C. T. Liu, and R. G. Donnelly Sep. 1972 36 p refs
(Contract W-7405-eng-26)
(ORNL-4813) Avail: NTIS

New platinum alloys were developed as possible encapsulating materials in space isotopic heat sources. Alloys containing 26 to 30% Rh, 6 to 10% W, 0 to 1.0% Hf, and 0 to 0.5% Ti (by weight) are only slightly less oxidation resistant than platinum up to 1200 C, have higher tensile strengths than TZM or Pt-30% Rh at all temperatures, and are as strong as iridium but somewhat weaker than T-111 at 1316 C. Limited results suggest that these new alloys are readily fabricable, are compatible with heat source environments to at least 1100 C, and possess the highest toughness and post-impact oxidation resistance of all candidate alloys. Author (NSA)

N73-17633# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
CHARACTERIZATION STUDY AND EVALUATION OF THE POSSIBLE USE OF ORTHOFERRITES Final Report [ETUDE DE CARACTERISATION ET D'EVALUATION DES POSSIBILITES D'EMPLOI DES ORTHOFERRITES]
P. Bied-Charreton and Khai Tranvan 17 Jun. 1971 16 p refs In FRENCH
(Contract DGRST-70-02-185)
(LCR-71-97/1/R) Avail: NTIS HC $3.00

Material tests to determine the static and dynamic properties of magnetic walls and to characterize the crystallographic, magnetic, and optical properties of orthoferrites are described. Plane and cylindrical walls were investigated. The analysis of T-bar propagator properties has enabled identification of general principles applied to all structures. Two low frequency propagators were developed to verify the theoretical estimations. ESRO

N73-17634# British Steel Corp., London (England). Metallurgy Dept.
MATERIAL PROPERTIES FOR SHEET FORMABILITY
I. L. Dillamore Aug. 1972 20 p refs Presented at British Deep Drawing Res. Group Ann. Symp., Birmingham, Engl., 12 Apr. 1972
(PB-212207; MG/16/72) Avail: NTIS HC $3.00 CSCL 11F

The material properties of work hardening behavior, anisotropy, strain rate sensitivity and ductility are discussed in relation to sheet formability and the scope for improving forming properties through these variables is considered. It is shown that the scope for improvements through increasing the sustained work hardening capacity and the anisotropy is useful but subject to natural limitations. Strain rate effects in pressing operations are not controlled mainly by the material but by process considerations. Ductility is dictated by the inclusion content of the material and the improvement of material cleanliness is the most important means of raising quality and performance. The forming and subsequent properties of high strength sheet materials are briefly reviewed and here especially the inclusion content is of major importance. Author (GRA)

N73-17635# British Steel Corp., London (England). Metallurgy Dept.

FATIGUE CRACK PROPAGATION IN STEELS

C. E. Nicholson and A. H. Priest Aug. 1972 22 p refs

(PB-212208; MG/70/71) Avail: NTIS HC $3.00 CSCL 11F

Fatigue crack propagation rates were measured in a number of steels heat treated to give a wide range of strength and toughness levels. Several thicknesses and geometries of test pieces were tested including 1/8 in. thick center-cracked sheet tension, 1/2 in. thick compact tension, 1 in. thick compact tension and 1 in. thick wedge-open-loaded test pieces; no significant differences were observed in the data from the different specimens. Little difference was observed in the crack propagation behavior of steels with martensitic and bainitic microstructures tested in either longitudinal or transverse directions. Steels tempered at 200 C tended to have a slightly higher rate of crack propagation. Author (GRA)

N73-17636# British Steel Corp., London (England). Metallurgy Dept.

A TECHNIQUE FOR MONITORING CRACK OPENING DISPLACEMENT MEASUREMENT

P. McIntyre and D. Elliott Aug. 1972 20 p refs

(PB-212206; MG/15/72) Avail: NTIS HC $3.00 CSCL 11F

An electrical resistance crack monitoring technique has been developed to enable the detection of the crack extension processes which occur during the measurement of crack opening displacement in steels. The approach is able to distinguish between stretch zone formation, which occurs early in the loading process, and fibrous extension which follows it. Results are presented for two low strength carbon-manganese steels in which the crack extension which accompanies COD measurement over a range of temperatures has been monitored by the electrical resistance technique and confirmed by subsequent fractographic examination. Author (GRA)

N73-17637# Aerospace Corp., El Segundo, Calif. Lab. Operations.

THE EFFECT OF A LOADING SEQUENCE ON THRESHOLD STRESS INTENSITY DETERMINATION Report for Jun. 1971 - Apr. 1972

William C. Harrigan, Jr., Dennis L. Dull, and Louis Raymond 15 Nov. 1972 31 p refs

(Contract F04701-72-C-0073)

(AD-752215; TR-0073(3250-10)-1; SAMSO-TR-72-263) Avail: NTIS CSCL 11/6

The effect of a loading sequence on the stress corrosion cracking of AISI 4340 steel and Ladish D6AC steel in an aqueous environment was studied with double-cantilever beam specimens. Author (GRA)

N73-17638# Florida Univ., Gainesville. Engineering and Industrial Experiment Station.

DEVELOPMENT OF EXPERIMENTAL POURBAIX DIAGRAMS FOR THE PREDICTION OF CORROSION BEHAVIOR Annual Progress Report, 1 Dec. 1971 - 30 Nov. 1972

Ellis D. Verink, Jr. 30 Nov. 1972 56 p refs

(Contract N00014-68-A-0173-0015; NR Proj. 036-092)

(AD-752487) Avail: NTIS CSCL 11/6

The report discusses research aimed at developing experimental potential vs pH diagrams for engineering alloys in aqueous electrolytes with and without chlorides present. Research includes experiments to elucidate the significance of the protection potential and the mechanisms involved in reducing the corrosion rate to very low values in the vicinity of E(p). An attempt is made to correlate crevice corrosion with the chemistry within active crevices. Author (GRA)

N73-17639# Massachusetts Inst. of Tech., Cambridge. Dept. of Metallurgy and Materials Science.

GROWTH OF MULTICOMPONENT COMPOSITES FROM THE MELT Annual Summary Technical Report, 1 Mar. 1971 - 29 Feb. 1972

Michael D. Rinaldi, Roy M. Sharp, and Merton C. Flemings Wright-Patterson AFB, Ohio AFML Mar. 1972 96 p refs

(Contract F33615-71-C-1374; AF Proj. 7353)

(AD-752609; AFML-TR-72-161) Avail: NTIS CSCL 11/6

A simple constitutional supercooling analysis is given for predicting interface stability in plane front solidification of ternary alloys containing one, two, or three phases. It is concluded that polyphase composites can be grown from ternary alloys by plane front solidification provided thermal gradient is sufficiently high, growth rate is low, convection is low and kinetic undercooling is small. Calculated examples of conditions required for stability are given for three-phase alloys from the aluminum-rich corner of the Al-Cu-Ni system. It is seen that the most stable compositions (with respect to interface breakdown) lie nearly, but not exactly, on lines of two-fold saturation. Ternary alloys from the Al rich corner of the Al-Cu-Ni system were unidirectionally solidified under a wide variety of growth conditions. Plane front solidification was achieved at sufficiently high thermal gradients and slow growth rates. Conditions necessary to cause planar interface breakdown in both two and three phase alloys compare well to those predicted by a simple constitutional supercooling criterion. Author (GRA)

N73-17640# Aluminum Co. of America, New Kensington, Pa. Research Labs.

FEASIBILITY STUDY FOR DEVELOPMENT OF AN ALUMINUM ALLOY FOR FABRICATION OF SMALL ARMS CARTRIDGE CASES Final Report, 2 Apr. 1970 - 2 Jun. 1972

Ralph W. Rogers, Jr. Jun. 1972 75 p refs

(Contract DAAA25-68-C-0771)

(AD-749508; Rept-13-AX202) Avail: NTIS CSCL 19/1

Seventeen experimental heat-treatable Al-Zn-Mg-Cu alloys and four Al-Mg or Al-Mg-Zn strain-hardenable alloys were evaluated for suitability as cartridge case materials. Sixteen alloys were of low impurity level achieved by use of refined 99.99 Al ingot as base metal and were rolled to .015 inch and .063 inch sheets by practices developing high degrees of homogeneity. Five alloys were of moderate purity. Comparisons among alloys were made on basis of strength-toughness characteristics, corrosion resistance, temperature stability, quench sensitivity, annealing characteristics and grain size properties. Author

N73-17641# Stanford Univ., Calif. Microwave Lab.

INVESTIGATION OF ELECTRONICALLY TUNABLE OPTICAL FILTERS Annual Report, 1971

Dec. 1971 34 p refs

(Contract N00014-67-A-0112-0036; NR Proj. 016-106)

(AD-752053; SU-ML-2026) Avail: NTIS CSCL 20/6

The authors have demonstrated an electronically tunable dye laser whose wavelength could be varied over 800A with a resolution of about 1A. Of particular importance, this electronically tuned laser has the unique capability of producing two randomly accessible and simultaneous frequencies. This capability was obtained by allowing two acoustic frequencies to be simultaneously incident on the acousto-optic filter. Each of these frequencies create an independent passband which may be tuned and modulated without regard to other output frequencies of the device. In another area of substantial progress on this contract a combined theoretical and experimental study of the aperture bandwidth characteristics of the electronically tunable optical filter has been completed. GRA

N73-17642# North American Rockwell Corp., Thousand Oaks, Calif. Science Center.

DEFORMATION AND SOLID SOLUTION STRENGTHENING OF BCC TITANIUM-VANADIUM ALLOYS Annual Report

N. E. Paton and J. C. Williams 7 Aug. 1972 26 p refs

(Contract N00014-71-C-0363)

(AD-752082; SC518.2AR) Avail: NTIS CSCL 11/6

The purpose of the study was to investigate systematically the effects of oxygen concentration on the deformation of Ti-V alloys and to study the combined effects of the substitutional V additions and interstitial oxygen additions on the thermal and athermal components of the flow stress and on dislocation arrangements. The effect of oxygen content on the critical resolved shear stress of Ti-40V single crystals was evaluated as a function of temperature. Author (GRA)

N73-17643# New York Univ., N.Y. Engineering Research Div.

STRENGTHENING MECHANISM OF HIGH STRENGTH TITANIUM ALLOYS Summary Technical Report, 1 Jan. - 31 Dec. 1971

Harold Margolin, Michael A. Greenfield, Ernest Levine, Ira Greenhut, and Hoon Park Mar. 1972 72 p refs
(Contract F33615-71-C-1301; AF Proj. 7351)
(AD-752575; AFML-TR-72-78) Avail: NTIS CSCL 11/6

An investigation has been initiated to determine the relationship between the fracture toughness and yield strength in the alpha-beta alloy, Ti-5.25Al-5.5V-0.9Fe-0.5Cu.
Author (GRA)

N73-17644# United Aircraft Corp., East Hartford, Conn. Research Labs.
HIGH TEMPERATURE EUTECTIC COMPOSITE AND ITS MODIFICATION Final Report, 7 Oct. 1971 - 7 Nov. 1972
E. H. Kraft and E. R. Thomson Nov. 1972 63 p refs
(Contract N00019-72-C-0192)
(AD-752632; UARL-L911270-4) Avail: NTIS CSCL 11/6

The present investigation attempted to improve the ductility of eutectic alloy Ni3Al (gamma:)-Ni3Cb(delta) by compositional modification, to produce further increases in high temperature strength by alloying, to evaluate the mechanical anisotropy of the eutectic, to demonstrate diffusion bonding the composite and to develop procedures for forming protective coatings. GRA

18 MATERIALS, NONMETALLIC

Includes corrosion; physical and mechanical properties of materials (e.g., plastics); and elastomers, hydraulic fluids, etc. For basic research see: 06 Chemistry. For related information see also: 17 Materials, Metallic; 27 Propellants; and 32 Structural Mechanics.

N73-17645*# Teledyne Brown Engineering, Huntsville, Ala.
ANALYTICAL STUDY OF SPACECRAFT DEPOSITION CONTAMINATION BY INTERNAL REFLECTION SPECTROSCOPY Final Report
T. Mookherji Dec. 1972 61 p refs
(Contract NAS8-28533)
(NASA-CR-124072; SE-SSL-1678) Avail: NTIS HC $5.25 CSCL 22B

Infrared absorption spectra of ten individual contaminant materials and four binary mixtures of these have been studied using the internal reflection spectroscopy technique. The effect of ultraviolet radiation on these contaminants has also been studied. It has been observed that all siloxanes, silanes, and esters are drastically affected by ultraviolet irradiation. In most cases polymerization and tar formation results. Author

N73-17646*# McDonnell-Douglas Astronautics Co., St. Louis, Mo.
IMPROVEMENT OF REUSABLE SURFACE INSULATION (RSI) MATERIALS Final Report, 23 Jun. 1971 - 23 Jun. 1972
J. C. Blome 4 Aug. 1972 150 p refs
(Contract NAS8-27688)
(NASA-CR-124053; MDC-E0647) Avail: NTIS HC $9.50 CSCL 11D

The mullite fiber based hardened compacted fibers (HCF) type of reusable surface insulation was further developed for use in the Space Shuttle Program. Two hundred fifty formulations of fiber mixtures, fillers, binders, and organic processing aids were made using mullite fibers as the basic ingredient. Most of the work was accomplished on 15-lb/cu ft material. It was established that higher density materials are stronger with strength values as high as 250 lb/sq in. in tension. New measurement techniques and equipment were developed for accurate determination of strength and strain to failure. Room temperature to 2300 F stress-strain relationships were made. The room temperature tensile modulus of elasticity is 61,700 lb/sq in. and the strain at failure is 0.165 percent, typically, when measured longitudinally parallel to the long axes of the fibers. Thermal insulating effectiveness was increased 20 percent by reducing the diameter of some of the fibers in the material. Improvements were made in density uniformity and strength uniformity in a block of HCF by mixing improvements and by the use of organic additives. Specifications were established on the materials and processes used in making the insulation.
Author

N73-17647*# Boeing Co., Seattle, Wash. Research and Engineering Div.
EFFECTS OF SURFACE POLISHING ON THE MICROSTRAIN BEHAVIOR OF TELESCOPE MIRROR MATERIALS
William A. Eul and W. William Woods [1973] 36 p refs
(Contract NAS1-10783)
(NASA-CR-112217) Avail: NTIS HC $4.00 CSCL 11B

Rough ground silicic mirror substrate materials were found in previous investigations to exhibit significant surface yield. This effect was removed by surface etching, a procedure not normally employed in the finishing of optical telescope mirrors. The effects of fine grinding and polishing techniques as well as graded etching are investigated. Torsional shear measurements of yield strain versus stress are made on four candidate mirror substrate materials: polycrystalline silicon, ULE silica 7971, CER-VIT 101, and fused silica 7940. Commonly employed fine grinding and polishing practices are shown to remove a major portion of the surface yield found in rough ground mirror substrate materials.
Author

N73-17648*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
EFFECT OF ENVIRONMENT ON INSULATION MATERIALS, VOLUME 1 Final Report
R. T. Parmley, F. J. Smith, A. P. Glassford, J. Coleman, and D. R. Stevenson Feb. 1973 141 p refs
(Contract NAS3-14342)
(NASA-CR-120978; LMSC-D157192-Vol-1) Avail: NTIS HC $9.25 CSCL 11D

Twenty candidate multilayer insulation and insulation related materials were subjected to eight conditions that represent possible operational environments. These exposures include ground contaminants, various operational temperatures, space vacuum, space-vented propellants, and tank leakage. The objective of this program was to obtain and evaluate the data from these exposures to provide both a quantitative and qualitative description of the degradation to certain physical and thermal properties, and from this, to obtain a better understanding of the environmental effects on the insulation performance. Author

N73-17649*# Lockheed Missiles and Space Co., Sunnyvale, Calif.
EFFECT OF ENVIRONMENT ON INSULATION MATERIALS, VOLUME 2: MATERIALS PROPERTY HANDBOOK
R. T. Parmley, F. J. Smith, A. P. Glassford, J. Coleman, and D. R. Stevenson Feb. 1973 554 p
(Contract NAS3-14342)
(NASA-CR-120979; LMSC-D157192-Vol-2) Avail: NTIS HC $29.75 CSCL 11D
For Abstract See N73-17648

N73-17650*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Engineering Mechanics Div.
ESTIMATING WEIBULL PARAMETERS FOR MATERIALS
E. Y. Robinson 15 Dec. 1971 69 p
(Contract NAS7-100)
(JPL-TM-33-580; NASA-CR-130725) Avail: NTIS HC $5.50 CSCL 11D

The statistical analysis of strength and fracture of materials in general, with application to fiber composites are discussed. The weakest link model is considered in a fairly general form, and the resulting equations are demonstrated by using a Weibull distribution for flaws. This distribution appears naturally in a variety of problems, and therefore additional attention is devoted to analysis and statistical estimation connected with this distribution. Special working charts are included to facilitate interpretation of observed data and estimation of parameters. Implications of the size effect are considered for various kinds of flaw distributions. Failure and damage in a fiber-reinforced system are described. Some useful graphs are included for predicting the strength of such a system. Recent data on organic-fiber (PRD 49) composite material is analyzed by the Weibull distribution with the methods presented. Author

N73-17651# Toulouse Univ. (France).
STUDY OF CRATERS FORMED ON GLASS SURFACES BY THE IMPACT OF ARTIFICIAL MICROMETEORITES Ph.D. Thesis [ETUDE DE CRATERES FORMES SUR DES SURFACES DE VERRE PAR L'IMPACT DE MICROMETEORIDES ARTIFICIELLES]
Jean-Claude Mandeville 1972 152 p refs In FRENCH Sponsored by ESRO
Avail: NTIS HC $9.75

Damage caused by hypervelocity projectiles on different types of glass are discussed. Projectiles with masses of 1 to 100 picograms were accelerated by means of an electrostatic accelerator to speeds of 1 to 15 kilometers per second. Projectiles made of polystyrene, aluminum, and iron particles were tested. The morphology of craters was analyzed as a function of impact velocity. A theoretical approach using the Rankine Hugoniot equations is discussed. It is shown that 30 percent of the kinetic energy of the projectile is used to heat both the projectile and the target, 20 percent to fracture the target, and 50 percent to accelerate break away pieces. ESRO

N73-17652*# Los Alamos Scientific Lab., N.Mex.
CMB-13 RESEARCH ON CARBON AND GRAPHITE Progress Report, 1 Aug. - 31 Oct. 1971
Morton C. Smith Mar. 1972 11 p refs Sponsored in part by NASA
(Contract W-7405-eng-36)
(NASA-CR-130539; LA-4917-PR; Rept-19) Avail: NTIS HC $3.00 CSCL 11D

The research on graphite and carbon for this period is reported. Topics discussed include: effects of grinding on the Santa Marie graphites, properties and purities of coal-tar, resin-bonded graphite, carbonization of resin components, and glass-like carbon filler. F.O.S.

N73-17653# Sandia Labs., Albuquerque, N.Mex.
DYNAMIC MECHANICAL BEHAVIOR OF POLYMETHYL METHACRYLATE
K. W. Schuler and J. W. Nunziato 1972 25 p refs Presented at 6th Ann. Congr. of Rheol., Lyon, 4 Sep. 1972 Sponsored by AEC
(SC-DC-721174; Conf-720930-2) Avail: NTIS

In order to investigate the early time response of solid polymers, a high resolution laser interferometer has been employed to observe the detailed structure of stress waves produced by the impact of polymeric plates. From the observed stress waves the loading and unloading stress-strain paths followed by the material can be determined. For the polymer, polymethyl methacrylate, over the stress range from 0-60 kbar such observations have disclosed a stress-strain behavior which exhibits large strain nonlinearities and significant rate dependence. For stress levels below 7 kbar and above 40 kbar, the rate effects are of secondary importance and the observed wave profiles may be modeled using a nonlinear elastic description of the material behavior. However, at about 7 kbar, a transition is observed in the dynamic stress-strain behavior which is characterized by greater stress relaxation and significant hysteresis upon unloading. This transition. Which is attributed to a yield phenomenon, requires a rate dependent description of the material behavior to be used in the stress range of approximately 7 to 40 kbar. Author

N73-17654# Royal Aircraft Establishment, Farnborough (England).
FABRIC PROPERTIES AND THE WEAR OF HOVERCRAFT FINGERS
J. E. Swallow, J. H. Cadwell, and M. Webb Oct. 1971 27 p refs
(RAE-TR-71210; BR-27693) Avail: NTIS HC $3.50

The wear of fingers made from 16 types of coated fabric was studied on an SRN 5 hovercraft. Laboratory determinations of a number of fabric properties were made, and the results correlated with wear behavior, using correlation and factor analysis techniques. The extent to which the laboratory tests enable wear to be predicted was also investigated. ESRO

N73-17655# Air Force Materials Lab., Wright-Patterson AFB, Ohio.
THE CORRELATION OF NONDESTRUCTIVE TEST TECHNIQUES WITH THE FRACTURE BEHAVIOR OF ATJ-S GRAPHITE Technical Report, 30 Nov. 1968 - Dec. 1970
W. L. Shelton and G. R. Atkins Aug. 1972 177 p refs
(AF Proj. 7351)
(AD-751976; AFML-TR-72-38) Avail: NTIS CSCL 11/2

Selected specimens of ATJ-S graphite were nondestructively evaluated and tensile tested in gas-bearing test facilities. The nondestructive test methods used on billets, specimen blanks, and finished specimens were visual inspection, alcohol wipe, radiography, and radiographic enhancement techniques. Correlations were made between nondestructive test indications and fracture location and strength. Low density areas were found to be the predominant weakening defect in this graphite. Fractographic examination of the fractured specimens revealed flaws which could be correlated with those flaws detected nondestructively and predicted from Griffith's theory. Author (GRA)

N73-17656# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
STUDY OF THE PLASTICIZATION OF POLYVINYL CHLORIDE WITH MIXTURES OF ALPHA-(TRICHLOROMETHYL)-BENZYL CAPRATE AND DIOCTYL PHTHALATE
E. A. Reznik and R. G. Timergaleev 25 Oct. 1972 14 p refs Transl. into ENGLISH from Izv. Vyssh. Ucheb. Zaved., Khim. i Khim. Tekhnol. (Moscow), v. 14, no. 5, 1971 p 767-770
(AD-751875; FTD-HT-23-935-72) Avail: NTIS CSCL 11/9

The effectiveness of mixtures of plasticizers of polyvinyl chloride was investigated using alpha-(1,1,1-trichloromethyl)-benzyl caprate (I) and dioctylphthalate (DOF) as examples. It was shown that the physicomechanical properties of systems containing comparitively small doses of ester I and DOF, do not adhere to the law of additivity. With a total content of plasticizers at 30-40 pbw per 100 pbw of PVC samples plasticized with pure ester I possess higher physicomechanical indices. A clearly expressed synergic effect of the plasticization is observed. GRA

N73-17657# Bell Aerospace Co., Buffalo, N.Y.
ANALYTICAL MODELING OF SUBSONIC PARTICLE EROSION Summary Technical Report, Jun. 1971 - Jun. 1972
William F. Adler and George T. Sha Jul. 1972 116 p refs
(Contract F33615-71-C-1528; AF Proj. 7342)
(AD-752221; AFML-TR-72-144) Avail: NTIS CSCL 11/2

An analytical approach to particle erosion of solid surfaces is developed based on a model of erosion pit nucleation and growth. The Hertzian theory of impact is used to introduce the kinematic and material parameters into this general statistical formulation of erosion processes. In order to minimize the number of unknown factors in the initial development of a predictive erosion theory, the particular case of solid spherical particles impacting directly on the plane surface of an elastic half-space is investigated. Erosion tests were conducted on the AFML-Bell erosion apparatus in conjunction with the modeling studies. The erosion mechanism in fused silica was identified when eroded by multiple impacts of spherical glass beads. Author (GRA)

N73-17658# Environmental Health Lab., Kelly AFB, Tex.
CHEMICAL AND PHYSICAL PROPERTIES AND THERMAL DECOMPOSITION PRODUCTS OF CERTAIN NATURAL PRODUCTS AND SYNTHETIC MATERIALS
Walter W. Melvin, Jr. May 1972 172 p refs
(AD-751899; EHL-K-72-14) Avail: NTIS CSCL 11/9

A limited review of the literature including the early history and current data on deaths, injuries and costs due to the combustion and pyrolysis of resins, plastics and natural materials is provided. There is a limited discussion of the chemistry and physical properties of plastics. Applications of these materials in wearing apparel, construction trades, the aircraft industry, and others are discussed. Experimental data on the pyrolysis products of five synthetic and natural fiber carpets are presented. An extensive collection of tables from a number of sources give data on the trade name, type of plastic and manufacturer, physical and chemical properties, decomposition products, and other information. Author (GRA)

N73-17659# Naval Ship Research and Development Center, Bethesda, Md.
DETERMINING THE DYNAMIC BULK MODULUS AND THE ELASTIC-LOSS FACTOR OF POLYMERS FROM ACOUSTIC MEASUREMENTS
Jan M. Niemiec Oct. 1972 23 p
(SF35452003)
(AD-752483; NSRDC-3858) Avail: NTIS CSCL 11/9

A dynamic measurement technique is presented for determining the bulk modulus and the associated-loss factor of elastomeric and plastic materials. A resonant water column is used from which stiffness and damping are determined by the resonance frequency and the bandwidth of its resonance curve. A sample is inserted into the water column at a pressure maximum, and the resonance frequency and the bandwidth of the system are measured. The difference in the resonance frequency and the bandwidth of the water column without and with the sample present is then used to calculate the real component of the bulk modulus and the loss factor of the sample. Experimental results for various materials are presented which verify the theory. Author (GRA)

N73-17660# California Univ., Berkeley. Dept. of Chemical Engineering.
VISCOELASTIC PROPERTIES OF HETEROPHASE BLENDS OF HOMOPOLYMERS AND BLOCK COPOLYMERS
G. Choi, A. Kaya, and M. Shen 15 Nov. 1972 28 p refs
Submitted for publication
(Contract N00014-69-A-0200-1053; NR Proj. 356-526)
(AD-752622; TR-2) Avail: NTIS CSCL 11/9

Stress relaxation and dynamic mechanical measurements were carried out for two types of heterophase polyblends. One is obtained by blending homopolymers of butadiene and styrene (high impact polystyrene of HIPS); the other by blending homopolymer of butadiene with a triblock copolymer of styrene-butadiene-styrene (SBS/B). It was found that for HIPS, time temperature superposition is difficult, and the shift factors cannot be adequately interpreted by a reasonable model. For SBS/B it is impossible to carry out superposition. Possible mechanisms giving rise to the new transition are discussed.
Author (GRA)

N73-17661# Naval Air Development Center, Warminster, Pa. Air Vehicle Technology Dept.
INVESTIGATION OF THE EFFECTS OF LIQUID OXYGEN ON CHEMICALLY TREATED SURFACES OF ALUMINUM TUBING
M. Perlman and J. F. Danovich 16 Oct. 1972 11 p refs
(AD-752030; NADC-72201-VT) Avail: NTIS CSCL 11/3

The report describes the effects of liquid oxygen on chemically treated (chromic acid anodized and chromate conversion coated) surfaces of aluminum tubing used in aviators' breathing systems. Tests were conducted to detect residual deposits, gaseous contamination and changes in surface structure. Author (GRA)

N73-17662# Avco Corp., Lowell, Mass. Systems Div.
RESEARCH ON DEVELOPMENT AND FABRICATION OF BORON SUBOXIDE SPECIMENS Final Report, 15 Mar. 1971 - 14 Mar. 1972
William H. Rhodes and A. Joseph DeLai Wright-Patterson AFB, Ohio AFML Aug. 1972 28 p refs
(Contract F33615-71-C-1449)
(AD-751980; AVSD-0350-72-CR; AFML-TR-72-159) Avail: NTIS CSCL 11/2

The work describes the processing of dense boron suboxide by hot pressing. Sound billets four inches diameter by three-eighths inch thick were consolidated to a density as high as 99.2% of theoretical. Adjustment of process parameters was very critical as incorrect parameters resulted in either low density, excessive decomposition, or cracked billets. Several process modifications were identified that reduced production costs. Author (GRA)

N73-17663# Midwest Research Inst., Kansas City, Mo.
THE TENSILE STRENGTH OF BORON FILAMENT
C. D. Swanson and J. R. Hancock Nov. 1972 23 p refs
(Contract N00014-70-C-0212; NR Proj. 031-743)
(AD-752505; TR-5) Avail: NTIS CSCL 11/5

The ultimate tensile strength of two commercial boron filaments, one of 0.0102 cm (0.0040 in.) and the other of 0.0142 cm (0.0056 in.) diameter, was determined for the as-received condition and after annealing in vacuum (525C, 1 hr, 0.00001 torr). The distributions in strength were negatively skewed and annealing increased the mean strength of the filaments by 0.14 plus or minus 0.06 GN/sq m (20,300 plus or minus 8,700 psi). Scanning electron microscopy showed that the fracture surfaces were usually cone-shaped and that a characteristic lip occurred near the circumference of the larger filaments. Author (GRA)

N73-17664# Naval Material Industrial Resources Office, Philadelphia, Pa.
NAVMIRO MANUFACTURING TECHNOLOGY BULLETIN. NUMBER 34: EPOXY COATINGS FOR CORROSION PROTECTION
Harry Shapiro Sep. 1972 8 p
(AD-752039) Avail: NTIS CSCL 11/3

Describes the cleaning of materials and methods used for producing corrosion resistance epoxy coatings. GRA

N73-17665# Naval Ordnance Lab., White Oak, Md.
NEUTRON RADIOGRAPHY OF MASSIVE FIBER GLASS COMPOSITE STRUCTURES: A FEASIBILITY STUDY
Robert A. Youshaw 30 Jun. 1972 36 p refs
(SF51541009)
(AD-752457; NOLTR-72-78) Avail: NTIS CSCL 11/4

The feasibility of applying neutron radiography to the inspection of fiber glass composites has been studied. From considerations of the ratio of scatter to capture for neutrons over the entire range of available energies, it is concluded that neutron radiography is not suited to the inspection of massive fiber glass structures. Conversely, it has been shown that conventional radiography can be usefully applied. GRA

N73-17666# Artech Corp., Falls Church, Va.
SILICON CARBIDE WHISKER-METAL MATRIX COMPOSITES Final Report, 1 Dec. 1969 - 30 Sep. 1971
Fred Ordway, Paul J. Lare, and Robert A Hermann Mar. 1972 74 p refs
(Contract F33615-69-C-1187; AF Proj. 7351)
(AD-752589; Rept-8421-FR; AFML-TR-71-252) Avail: NTIS CSCL 11/4

Aluminum alloy composites reinforced with silicon carbide whiskers were prepared by liquid-phase hot pressing of aligned whisker-powder bodies. Biaxial (x-y) alignment was obtained by filtering a liquid slurry. Uniaxial alignment was obtained by performing the filtration in a magnetic field, extruding the whisker-powder mixture suspended in solid camphene, or extruding the hot-pressed composite near the matrix melting temperature. Author (GRA)

N73-17667# Battelle Memorial Inst., Columbus, Ohio.
COMPOSITE DESIGN SYNTHESIS Semiannual Technical Report
Milton Vagins 21 Nov. 1972 39 p refs
(Contract N00014-72-C-0195; ARPA Order 1977)
(AD-752158; SATR-1) Avail: NTIS CSCL 11/4

It has long been recognized that structural elements composed of composite materials, such as glass, boron, carbon, or other filaments, embedded in a suitable matrix, offer outstanding strength-to-weight ratios. The present and growing use of structural elements fabricated from composite materials creates the need for the development of a rational analytic design basis, which to a great extent is presently non-existent. The work described deals with the first phase of an effort to develop a design synthesis methodology for composites. It is directed specifically to the problem of heterogeneous plane elasticity.
GRA

19 MATHEMATICS

Includes calculation methods and theory; and numerical analysis. For applications see specific categories. For related information see also: 08 Computers.

N73-17668*# Brown Univ., Providence, R.I. Div. of Applied Mathematics.
SMOOTHING PROPERTIES OF NEUTRAL EQUATIONS
Jack K. Hale 30 Aug. 1972 6 p ref
(Grants NGL-40-002-015; AF-AFOSR-2078-71; DA-ARO(D)-31-124-712-G12S2)
(NASA-CR-130748) Avail: NTIS HC $3.00 CSCL 20H

A neutral functional differential equation is defined as d/dt(Dx sub t) = f(x sub t), with D linear, continuous, atomic at zero. The solution generally is no smoother than the initial data after any finite number of steps. A more restrictive class of D-operators for which some smoothing takes place after an infinite number of steps is defined. This result indicates that a solution can be in an omega-limit set only if it corresponds to initial data which are smooth. A space which can be considered as a Banach space with the topology of uniform convergence is also defined. Author

N73-17669# Loughborough Univ. of Technology (England). Dept. of Transport Technology.
SIMPLE METHODS FOR STUDY OF VEHICLE DYNAMICAL PROBLEMS. PART 1: EIGENVALUES AND VECTORS
F. D. Hales Nov. 1972 37 p refs
(TT-7212-Pt-1) Avail: NTIS HC $4.00

Commonly occurring sets of linear differential equations are reduced to a standard form for solution by numerical techniques. A FORTRAN computer program based on existing Algol procedures is outlined which finds the eigenvalues and eigenvectors of the equations. A simple example is given and the program listing is included. Author

N73-17670*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
A MESH GRADIENT TECHNIQUE FOR NUMERICAL OPTIMIZATION
Edward Allen Willis, Jr. Jan. 1973 182 p refs
(NASA-TM-X-68181) Avail: NTIS HC $11.25 CSCL 12A

A class of successive-improvement optimization methods in which directions of descent are defined in the state space along each trial trajectory are considered. The given problem is first decomposed into two discrete levels by imposing mesh points. Level 1 consists of running optimal subarcs between each successive pair of mesh points. For normal systems, these optimal two-point boundary value problems can be solved by following a routine prescription if the mesh spacing is sufficiently close. A spacing criterion is given. Under appropriate conditions, the criterion value depends only on the coordinates of the mesh points, and its gradient with respect to those coordinates may be defined by interpreting the adjoint variables as partial derivatives of the criterion value function. In level 2, the gradient data is used to generate improvement steps or search directions in the state space which satisfy the boundary values and constraints of the given problem. Author

N73-17671*# Scientific Translation Service, Santa Barbara, Calif.
OSCILLATION THEOREMS FOR CANONICAL SYSTEMS OF DIFFERENTIAL EQUATIONS
V. B. Lidskiy Washington NASA 23 Feb. 1973 11 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 102, no. 5, 1955 p 877-880
(Contract NASw-2483)
(NASA-TT-F-14696) Avail: NTIS HC $3.00 CSCL 12A

The well known Sturm-Liouville theory is discussed, along with similar facts for the case of a canonical system of an arbitrary number of equations. Author

N73-17672*# Linguistic Systems, Inc., Cambridge, Mass.
OSCILLATORY PROPERTIES OF THE SOLUTIONS OF STANDARD LINEAR SETS OF DIFFERENTIAL EQUATIONS
Yakubovich Washington NASA Feb. 1973 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 124, no. 3, 1959 p 533-536
(Contract NASw-2482)
(NASA-TT-F-14809) Avail: NTIS HC $3.00 CSCL 12A

The equation dx/dt = JH(t)x is considered. All coefficients of the differential equations are assumed to be real functions, integrable with Lebesque integrals at any finite interval. The system is oscillatory or nonoscillatory according to given unbounded or bounded conditions, and these conditions are examined. The same is done for several differential equations. There is also an analysis of the number of existing eigenvalues for these differential equations. Author

N73-17673# Los Alamos Scientific Lab., N.Mex.
MONTE CARLO DEVELOPMENT AND APPLICATIONS IN THE LOS ALAMOS NUCLEAR ROCKET PROGRAM
Clayton W. Watson and Edmond D. Cashwell 1972 45 p refs Presented at 4th Intern. Conf. on Reactor Shielding, Paris, 9 Oct. 1972 Sponsored by AEC
(LA-DC-72-1078; Conf-721018-6) Avail: NTIS

The history of Monte Carlo use in the Rover nuclear rocket program at LASL is traced. The type of problems requiring Monte Carlo solutions and specific applications are discussed, the latter to show how need led to development and to illustrate capabilities. A synopsis of present codes, code characteristics, and available tally options is included. Of principal interest have been radiation environmental calculations for the Rover reactor-testing program. Recent emphasis, however, has been upon Monte Carlo criticality calculations. Data from experimental studies conducted explicitly to assess Monte Carlo results are presented and discussed. Monte Carlo criticality results are also compared with experiment. Finally, plans for the extension of Monte Carlo capabilities are outlined. Author (NSA)

20 METEOROLOGY

Includes climatology; weather forecasting; and visibility studies. For related information see also: 13 Geophysics; and 30 Space Sciences.

N73-17674 Warren Spring Lab., Stevenage (England).
MEASUREMENTS OF TOTAL OXIDANTS IN THE ATMOSPHERE
D. W. Scott 1970 20 p refs
(LR140(AP)) Copyright. Avail: Issuing Activity

A Dutch and a Warren Spring Laboratory method for measuring total oxidants in the atmosphere have been compared using a prepared ozone/oxygen mixture. Both methods use potassium iodide absorbing solutions, with sodium thiosulphate to bind the liberated iodine. Both absorbing solutions use the same neutral buffer material, mixed phosphates, but in different strengths. The Warren Spring Laboratory method was found to indicate ozone concentrations which were 83.5 per cent of those given by the Dutch method when measuring ozone levels between 2000 and 3000 micrograms/cu m. The stoichiometry of the ozone-iodide reactions on which the calculated ozone concentrations are based is taken to be 1 molecule of ozone reacted for 1 molecule of iodine freed at pH 7. An analytical procedure is recommended for future use. Author

N73-17675# Danish Meteorological Inst., Charlottenlund.
METEOROLOGICAL YEARBOOK. PART 1: DENMARK AND FAROE ISLANDS (EXCEPT GREENLAND), 1967
1972 193 p In DANISH and ENGLISH
(ISBN-87-7478-060-3) Avail: NTIS HC $11.75

Monthly and annual climatological summaries are presented for Denmark and the Faroe Islands for 1967. F.O.S.

N73-17676# Finnish Meteorological Inst., Helsinki.
AN INVESTIGATION INTO WIND SHEAR AT HELSINKI AIRPORT
Eero Immonen Jun. 1972 40 p refs
(TR-3) Avail: NTIS HC $4.25

Vertical wind shear measurements were made using a balloon rising with the average rate of 180 m/min and optical theodolites to measure the angle at 10 sec intervals and to check the rate of ascent. Weather permitting, soundings were carried out on three days of the week at four synoptic times from the beginning of April 1967 through March 1968. The annual, seasonal, and diurnal distributions are discussed and are graphed. N.E.N.

N73-17677# Finnish Meteorological Inst., Helsinki.
NUMERICAL WEATHER PREDICTION IN FINLAND DURING 1970
Daniel Soederman Jan. 1972 25 p refs
(TR-2) Avail: NTIS HC $3.25

The operational numerical analyses and forecasts are presented. Verification results of baroclinic forecasts produced by a filtered three-level model, divergent barotropic forecasts of the 500 and 100 mb levels and forecasts of the height, temperature and wind of the 700, 500, and 300 mb levels for aeronautical purposes are included. Author

N73-17678# Bureau of Meteorology, Melbourne (Australia).
MATHEMATICS IN METEOROLOGY: THEORY AND PRACTICE
W. J. Gibbs Aug. 1972 35 p refs Presented at Math. Sci. Section of the Congr. of the Australia - New Zealand Assoc. for the Advancement of Sci., Sydney, Aug. 1972
Avail: NTIS HC $3.75

The role of mathematics in meteorology is examined. The history of weather forecasting is reviewed along with numerical weather forecasting in Australia. It is concluded that operational numerical forecasting relies on the professional meteorologist with considerable mathematical ability, and specialized in numerical techniques. F.O.S.

N73-17679# Texas Univ., Austin. Atmospheric Science Group.
DIURNAL AND SEASONAL CHANGE OF THE URBAN HEAT ISLAND IN AUSTIN, TEXAS
Timothy W. Oujezdsky Jan. 1973 61 p refs
(Grant NSF GA-16822)
(Rept-34) Avail: NTIS HC $5.25

The change in the intensity of the urban heat island during two 24 hour periods (24-25 June 1971 and 3-4 February 1972) is presented. The data were obtained from thermistors mounted on two automobiles, an instrumented tower at the Balcones Research Facility in northern Austin, and recording thermographs placed in instrument shelters at various locations throughout the city. The urban temperature distribution at a height of approximately two meters for each of nine summer runs and seven winter runs are presented. A night and a day average for each season is also given. The urban heat island is most pronounced in the wintertime but still detectable in the summertime. The daytime summer heat island appears to have a slightly cooler central core in the downtown area. The data suggests that there is a positive relationship between the urban heat island intensity and the strength of the rural temperature inversion. Author

N73-17680# Texas Univ., Austin. Atmospheric Science Group.
WIND AND TEMPERATURE PROFILES IN AN URBAN AREA
John Peschier, Jr. Jan. 1973 40 p refs
(Grant NSF GA-16822)
(Rept-33) Avail: NTIS HC $4.00

The effect of an urban and suburban area on wind and temperature profiles at Austin, Texas, was studied using data obtained in the winter and summer of 1972. Two towers, one at a suburban site and the other at an urban site were instrumented for wind and temperature measurements. Data were obtained from instruments placed at 6, 10, 16, 27, and 44 m on the towers. Roughness and turbulence parameters were calculated from these data. The winter analyses at the suburban site revealed a distinct variation of roughness length and intensity of turbulence with the mean wind direction with roughness values ranging from 0.44 m to 2.4 m. The summer analysis at the same site yielded a nearly constant value of 2.4 m independent of wind direction. Unfortunately, anemometer failures at the urban site restricted the number of inter-site comparisons that could be made. Author

N73-17681# Texas Univ., Austin. Atmospheric Science Group.
TWO-DIMENSIONAL TIME-DEPENDENT NUMERICAL SIMULATION OF ATMOSPHERIC FLOW OVER AN URBAN AREA Ph.D. Thesis
Tsann-wang Yu Jan. 1973 124 p refs
(Grant NSF GA-16822)
(Rept-32) Avail: NTIS HC $8.25

An earth-atmosphere numerical model based on the conservation laws of hydrodynamics was used to investigate various urban heat island phenomena. The method employs upstream finite differencing on the advective terms. Time stepping is accomplished with a backward implicit scheme. The model predicts that, with temperature inversion upwind of a city, a major portion of the urban heat island can be produced by the increased surface roughness in the urban area. Numerical experiments conducted with various stable temperature stratifications show a linear relationship between urban heat island intensity and the rural temperature inversion with the heat island increasing in intensity as the upwind inversion becomes stronger. Numerical experiments conducted with various geostrophic wind speeds indicate the urban heat island intensity close to the surface to be inversely proportional to the geostrophic wind. Experiments including effects of urbanization due to different thermodynamic characteristics of the subsurface and to artificial heat input were also conducted. Near the surface the urban heat island generated by increased surface roughness in the city has a magnitude comparable to that produced by reasonable levels of artificial heat input. Author

N73-17682*# General Dynamics/Astronautics, San Diego, Calif. Aerospace Div.
MONITORING OF AIR POLLUTION BY SATELLITES (MAPS), PHASE 1 Final Report, 21 Sep. 1971 - 20 Mar. 1972
C. B. Ludwig, W. Malkmus, M. Griggs, and E. R. Bartle Apr. 1972 195 p refs
(Contract NAS1-11111)
(NASA-CR-112137; GDCA-HAB-73-005) Avail: NTIS HC $11.75 CSCL 04B

Results are reported upon which the design of a satellite remote gas filter correlation (RGFC) instrument can be based. Although a final decision about the feasibility of measuring some of the pollutants with the required accuracy is still outstanding and subject to further theoretical and experimental verifications, viable concepts are presented which permit the initiation of the design phase. The pollutants which are of concern in the troposphere and stratosphere were selected. The infrared bands of these pollutants were identified, together with the bands of interfering gases, and the line parameters of the pollutants as well as interfering gases were generated through a computer program. Radiative transfer calculations (line-by-line) were made to establish the radiation levels at the top of the atmosphere and the signal levels at the detector of the RGFC instrument. Based upon these results the channels for the RGFC were selected. Finally, the problem areas, which need further investigations, were delineated and the supporting data requirements were established. Author

N73-17683+ Deutscher Wetterdienst, Offenbach am Main (West Germany).
REPORTS FROM THE GERMAN METEOROLOGICAL SERVICE. VOLUME 17, NO. 129: THE GLOBAL ATMOSPHERICAL PRESSURE FIELD AT SEA LEVEL [BERICHTE DES DEUTSCHEN WETTERDIENSTES. BAND 17, NR. 129: DAS GLOBALE LUFTDRUCKFELD IN SEEHOEHE]
Lothar Kaufeld 1972 59 p refs In GERMAN; ENGLISH summary
Avail: NTIS HC $5.00

Two data samples were the basis of this work: (1) the daily grid point values of the IGY, and (2) mean monthly values of the period 1957-1962. Characteristics of the global pressure field, like the polar anticyclones, the subpolar troughs, the subtropical ridges and the equatorial trough, and their variations from day to day and from month to month were shown by latitudinal means, calculated from the IGY-data. Composing single latitude means to latitude belts enables us to point out the connections between the global pressure features. Special emphasis is given to daily and monthly variations of the global pressure. To obtain the monsoon effects of the pressure field, the earth was divided into zones, and the behavior of the pressure originating from the land-sea distribution is described. Charts are shown which reveal the general, the special geographic and the seasonal variable characteristics of the global pressure variation. Author

N73-17684# Asian Inst. of Tech., Bangkok (Thailand).
PROBABILITY MODELS OF WET AND DRY DAYS M.S. Thesis

Prasert Patramai 1971 129 p refs
(Thesis-392) Avail: NTIS HC $8.50

The problems of determining the probability models of wet and dry days for several stations in Thailand are considered. With the assumption of homogeneity of rainfall phenomena over each month, the first and the second order Markov chain fit very well for various threshold values by the Chi-square tests at 0.05 significant level. The elements of the transition matrices are estimated from the data by the maximum likelihood method. The mean monthly wet days computed from the long-run probabilities are compared with the observed mean, showing no difference, except in the month of October which is due to the sampling errors. The Chi-square tests of the order of Markov chain indicate that the order decreases toward zero as the threshold value increases. The probability and the probability density functions of the daily rainfall amount for three selected stations are fitted by the Pearson Type-3 distribution and are tested with the observed frequencies. Author

N73-17685# Japan Atomic Energy Research Inst., Tokai.
METEOROLOGICAL DATA AT THE OARAI SITE Annual Report, 1970
Dec. 1971 33 p refs In JAPANESE; ENGLISH summary
(JAERI-M-4657) Avail: AEC Depository Libraries

The data presented cover the one-year period of 1970. Meteorological statistics are given in the form of monthly summaries, which include daily and hourly averages of wind speed and other elements, occurrence frequencies of wind direction and atmospheric stability categories, and others. Author (NSA)

N73-17686# Institut Royal Meteorologique de Belgique, Brussels.
ATMOSPHERIC POLLUTION, SMOKE, AND SULFUR DIOXIDE Monthly Bulletin, Feb. 1972 [POLLUTION ATMOSPHERIQUE, FUMEE ET ANHYDRIDE SULFUREUX]
Feb. 1972 28 p refs In FRENCH and DUTCH Prepared jointly with Inst. d'Hyg. et d'Epidemiol.
Avail: NTIS HC $3.50

Data obtained at Belgian weather stations in February 1972 are tabulated. The air pollution apparatus is briefly described. ESRO

N73-17687# Institut Royal Meteorologique de Belgique, Brussels.
CLIMATOLOGICAL OBSERVATIONS Monthly Bulletin, Nov. 1972 [OBSERVATIONS CLIMATOLOGIQUES BULLETIN MENSUEL, NOVEMBRE 1972]
Nov. 1972 16 p refs In FRENCH and DUTCH
Avail: NTIS HC $3.00

Meteorological parameters observed at different Belgian weather stations during November 1972 are given. ESRO

N73-17688# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13801 LITTLE JOHN ARMP, MISSILE NOS. 3086 AND 3166 (27 SEPTEMBER 1972) Meteorological Data Report
Sep. 1972 32 p
(DA Proj. 1T6-65702-D-127)
(AD-752089; DR-727) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13801 Little John ARMP, Missile Numbers 3086 and 3166, are presented in tabular form. Author (GRA)

N73-17689# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE LANCE, MISSILE NO. 2138, ROUND NO. 165 RBT (18 OCTOBER 1972) Meteorological Data Report
Oct. 1972 44 p
(DA Proj. 1T6-65702-D-127)
(AD-752093; DR-731) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11601 Lance, Missile Number 2138, Round Number 165 RBT, are presented in tabular form. Author (GRA)

N73-17690# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex. Meteorological Data Report
THE 11601 LANCE, MISSILE NO. 2154, ROUND NO. 163 RBL (25 SEPTEMBER 1972)
Sep. 1972 67 p
(DA Proj. 1T6-65702-D-127)
(AD-752088; DR-726) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11601 Lance, Missile Number 2154, Round Number 163 RBL, are presented in tabular form. Author (GRA)

N73-17691# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Meteorology Lab.
AN EXPENDABLE, REMOTE OPERATING WEATHER STATION (EROWS) Interim Report
Russell M. Peirce and James F. Church 21 Aug. 1972 50 p refs
(AF Proj. 7045; AF Proj. 6670)
(AD-751924; AFCRL-72-0501; AFCRL-IP-179) Avail: NTIS CSCL 04/2

A self contained, air-droppable, Expendable, Remote-Operating Weather Station (EROWS) has been developed to obtain information on several basic meteorological parameters from those areas where such data are either limited or otherwise unattainable. The EROWS vehicle and its associated sensors are described in detail, along with a functional description of the control-recorder, aircraft repeater, and aircraft dispenser that constitute the remaining components of the complete system. The results of field tests of EROWS units conducted at several locations are described. The testing indicates that the system performed satisfactorily under a wide variety of conditions. Author (GRA)

N73-17692# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
DETERMINING THE NATURAL COMPONENTS OF METEOROLOGICAL FIELDS
D. M. Sonechkin 25 Sep. 1972 16 p refs Transl. into ENGLISH from Meteorol. Gidrol. (Moscow), no. 3, 1971 p 22-29
(AD-751958; FTD-MT-24-1013-72) Avail: NTIS CSCL 04/2

The article discusses the conditions for obtaining the analytical expressions for eigenvalues and functions (natural orthogonal components) of a homogeneous integral Fredholm equation. Examples for calculating these quantities by numerical methods and their analytical approximations are given. Their similarity confirms the applicability of analytical methods for determining the natural components in meteorology. Author (GRA)

N73-17693# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
ESTIMATING LIMITING VALUES OF THE PROBABILITY OF RARE EVENTS
M. V. Zavarina and V. V. Klingo 10 Nov. 1972 9 p refs Transl. into ENGLISH from Prikl. Klimatologiya (USSR), no. 246, 1969 p 87-89
(AF Proj. 7351)
(AD-751953; FTD-HT-23-1056-72) Avail: NTIS CSCL 04/2

Confidence intervals of the probability of the appearance of rare events are estimated as a function of the scale of the sample by which the probability is determined. A table of confidence intervals for actually encountered frequencies at a confidence probability of 99 percent is given. It is noted from the table that true probability of the event (and the average period of its recurrence) may differ several times from that calculated from the sample of frequency of recurrence. For example, if the probability of some meteorological element, calculated over a 30 year period of observations, is 10 percent (average period of recurrence corresponding to ten years), the maximum true value of probability will be equal to 31 percent, and the minimum, to 1.1 percent. Consequently, the minimum possible average period for recurrence will be three years, and the maximum will be 100 years. Author (GRA)

N73-17694# Sierra Research Corp., Boulder, Colo. Environmental Systems Group.
FIELD TEST OF WARM FOG DISPERSAL SYSTEM TO SUPPORT MARINE CORPS HELICOPTER OPERATIONS
Ralph Papania, Jr. 20 Jun. 1972 76 p refs
(Contract M00264-72-C-0094)
(AD-752046) Avail: NTIS CSCL 04/2

Warm fog dispersal techniques using helicopter downwash mixing and hygroscopic seeding were successfully tested to a limited degree on fog and low stratus. The equipment, procedures and nomograms for helicopter application of hygroscopic seeding materials are described as they were developed in three

field tests. Weather conditions suitable for dispersal operations occurred on only one day, during which a useable clearing was created in low stratus, 650 feet thick. Results show that the effectiveness of fog dispersal by helicopter downwash was considerably enhanced when the fog or stratus layer was treated with hygroscopic seeding agent (unsized urea in these particular tests). Some quantitative data and photographic coverage is presented. Author (GRA)

N73-17695# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 11602 LANCE, MISSILE NO. 5175, ROUND NO. 164 ESL (29 SEPTEMBER 1972) Meteorological Data Report
Sep. 1972 44 p
(DA Proj. 1T6-65702-D-127)
(AD-752090; DR-728) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 11602 Lance, Missile Number 5175, Round Number 164 ESL, are presented in tabular form. Author (GRA)

N73-17696# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13901 LITTLE JOHN, MISSILE NO. 1463, ROUND NO. 692 RG (16 OCTOBER 1972) Meteorological Data Report
Oct. 1972 22 p
(DA Proj. 1T6-65702-D-127)
(AD-752091; DR-729) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13901 Little John, Missile Number 1463, Round Number 692 RG, are presented in tabular form. Author (GRA)

N73-17697# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 14101 LITTLE JOHN RIP, MISSILE NO. 12751 (17 OCT. 1972) Meteorological Data Report
Oct. 1972 37 p
(DA Proj. 1T6-65702-D-127)
(AD-752092; DR-730) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14101 Little John RIP, Missile Number 12751, are presented in tabular form. Author (GRA)

N73-17698# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13801 LITTLE JOHN ARM-P RIPPLE, MISSILE NOS. 3102, 3142,3257, ROUND NOS. 693, 694, 695 RO (26 OCTOBER 1972) Meteorological Data Report
Oct. 1972 29 p
(AD-752095; DR-733) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13801 Little John ARM-P Ripple, Missile Numbers 3102, 3142, 3257, Round Numbers 693, 694, 695 RO, are presented in tabular form. Author (GRA)

N73-17699# Environmental Health Lab., McClellan AFB, Calif.
TECHNICAL REPORT BIBLIOGRAPHY Final Report
Gale F. Hoffnagle Aug. 1972 148 p
(AD-751898; EHL-M-72M-14) Avail: NTIS CSCL 13/2

A bibliography of all unclassified technical reports prepared by USAF Environmental Health Laboratory, McClellan is presented. It contains a listing by subject matter and a listing of all reports by year with report number and abstract. The reports cover most areas of environmental topics such as air, water, noise, and radiation pollution. GRA

N73-17700# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex. Meteorological Data Report
THE 14801 LANCE, MISSILE NO. 2183, ROUND NO. 167 APT (9 NOVEMBER 1972)
Nov. 1972 35 p
(DA Proj. 1T6-65702-D-127)
(AD-752098; DR-737) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 14801 Lance, Missile Number 2183, Round Number 167 APT, are presented in tabular form. Author (GRA)

N73-17701# Defense Documentation Center, Alexandria, Va.
WEATHER FORECASTING Report Bibliography, Feb. 1968 - Oct. 1971
Nov. 1972 265 p refs Supersedes DDC-TAS-68-17
(AD-751950; DDC-TAS-72-27; DDC-TAS-68-17) Avail: NTIS CSCL 04/2

This bibliography consists of references to unclassified and unlimited reports which were processed into the AD data bank from January 1968 through February 1972. Included are citations on short-range, medium-range, long-range, synoptic, numerical, statistical, local, terminal, and global weather forecasting, and references to prediction verification. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, and Report Number Indexes are included. GRA

N73-17702# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13801 LITTLE JOHN MISSILE NO. 3070, ROUND NO. 696 RO (26 OCTOBER 1972) Meteorological Data Report
Oct. 1972 23 p
(DA Proj. 1T6-65702-D-127)
(AD-752096; DR-734) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13801 Little John, Missile Number 3070, Round Number 696 RO, are presented in tabular form. Author (GRA)

N73-17703# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 12801 LANCE, MISSILE NOS. 2216/2310, ROUND NO. 166 EET (6 NOVEMBER 1972) Meteorological Data Report
Nov. 1972 48 p
(DA Proj. 1T6- 5702-D-127)
(AD-752097; DR-736) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 12801 Lance, Missile Numbers 2216/2310, Round Number 166 EET, are presented in tabular form. Author (GRA)

N73-17704# Atmospheric Sciences Lab., White Sands Missile Range, N.Mex.
THE 13401 HONEST JOHN, MISSILE NO. 2631, ROUND NO. 627 RUL (24 OCTOBER 1972) Meteorological Data Report
Oct. 1972 26 p
(DA Proj. 1T6-65702-D-127)
(AD-752094; DR-732) Avail: NTIS CSCL 04/2

Meteorological data gathered for the launching of 13401 Honest John Missile No. 2631, Round No. 627 RUL, are presented in tabular form. Author

N73-17705# Army Cold Regions Research and Engineering Lab., Hanover, N.H.
FOG DROP MEASUREMENTS AT BARROW, ALASKA Special Report
Motoi Kumai and R. F. Glienna Mar. 1972 22 p refs
(ARPA Order 1615; DA Proj. 1T0-61102-B-52A)
(AD-752129; CRREL-SR-166) Avail: NTIS CSCL 04/2

Arctic fog droplets were sampled on chloride-sensitive gelatin-coated glass slides at Point Barrow, Alaska, in the summer of 1971. The collection efficiency of the fog droplets was determined. About 20,000 fog drop radii were measured. The results of analysis of the concentration and the size distribution of fog drops are presented in the form of tables and photomicrographs. It is shown that the concentration and the size distribution changed rapidly with time and space; the drop radii ranged widely between 3.3 and 65 micrometers; the mean radius was 10 micrometers; the maximum concentration was 24 drops/cc and the liquid water content was 0.09 g/cubic meter at a visibility of 250 m. Calculations were made of the attenuation by fog at wavelengths of 0.571 and 1.06 micrometers for the observed size distributions and concentrations of fog drops. Author (GRA)

N73-17706# Texas A&M Research Foundation, College Station.
RESEARCH ON TROPICAL RAINFALL PATTERNS AND ASSOCIATED MESOSCALE SYSTEMS Annual Report
Walter K. Henry, John F. Griffiths, and Frank J. Klein Oct. 1972 99 p refs
(Contract DAAB07-71-C-0123)
(AD-752467; A/M-Ref-72-3-T; ECOM-0123-2-F) Avail: NTIS CSCL 04/2

A short discussion of the temporal and spatial variations of tropical rainfall is given. The rainstorms of Panama and Colombia are studied as to size and time of day. The size (amount of rain) is about the same at all places, but the time of occurrence is different at the different locations. The introduction of conditional probability (dry day following a dry day) leads to a simple method of calculating dry spells. Maps of the conditional probability are given for each month for Cambodia, and an explanation and example of the method is supplied. Rainfall patterns are studied for 15 stations in the Mekong Delta of Southeast Asia. Daily data were grouped into 5-day (pentad) totals. The beginning and end of the rainy season is identified by testing for significant differences between medians of consecutive pentads and computing the average rate of change in rainfall between pentads. Average dates for the beginning and end of the rainy season were determined and depicted on maps. Author (GRA)

21 NAVIGATION

Includes guidance; autopilots; star and planet tracking; inertial platforms; and air traffic control. For related information see also: 07 Communications.

N73-17707 Texas Univ., Austin.
AN ANALYSIS OF APPROACH NAVIGATION ACCURACY AND GUIDANCE REQUIREMENTS FOR THE GRAND TOUR MISSION TO THE OUTER PLANETS Ph.D. Thesis
Donald Wayne Jones 1971 160 p
Avail: Univ. Microfilms Order No. 72-15784

The navigation and guidance process for the Jupiter, Saturn, and Uranus planetary encounter phases of the 1977 Grand Tour Interior mission was simulated. The objectives were to define reference approach navigation accuracies, evaluate the relative information content of the various observation types, survey and define reference encounter guidance requirements, determine sensitivities to assumed simulation model parameters, and assess the adequacy of the linear estimation theory. A linear sequential estimator is used to provide an estimate of the augmented state vector which consists of the six state variables of position and velocity plus the three components of a planet position bias. The distribution of random observation errors is assumed to be Gaussian with zero mean and known covariance matrix. Navigation accuracies are determined from an analysis of the error covariance matrix associated with the state estimate. Dissert. Abstr.

N73-17708# Toronto Univ. (Ontario). Inst. for Aerospace Studies.
AIRCRAFT TRANSITION ALGORITHM FOR CONFLICT PREDICTION, WITH SPECIFIC REFERENCE TO THE NORTH ATLANTIC AIR TRAFFIC CONTROL SYSTEM
D. J. Mohr Jan. 1973 131 p refs
(UTIAS-TN-183) Avail: NTIS HC $8.75

The development of digital fast-time air traffic control conflict prediction simulation models is discussed. A simulation algorithm was designed for compatability with the Gander Automated Air Traffic System. The algorithm is applied to multiple aircraft strategically controlled environments and functions to search, detect, and resolve conflict situations during enroute aircraft transitioning. The simulation model includes meteorological data, route structure, flight trajectory construction, and a conflict resolution option. Author

N73-17709*# Smithsonian Astrophysical Observatory, Cambridge, Mass.
A NEW METHOD TO COMPUTE LUNISOLAR PERTURBATIONS IN SATELLITE MOTIONS
Yoshihide Kozai 1 Feb. 1973 33 p refs
(Grant NGR-09-015-002)
(NASA-CR-130743; SAO-Special-Rept-349; SAO-208-099) Avail: NTIS HC $3.75 CSCL 22C

A new method to compute lunisolar perturbations in satellite motion is proposed. The disturbing function is expressed by the orbital elements of the satellite and the geocentric polar coordinates of the moon and the sun. The secular and long periodic perturbations are derived by numerical integrations, and the short periodic perturbations are derived analytically. The perturbations due to the tides can be included in the same way. In the Appendix, the motion of the orbital plane for a synchronous satellite is discussed; it is concluded that the inclination cannot stay below 7 deg. Author

N73-17710*# Kanner (Leo) Associates, Redwood City, Calif.
VISUAL CONSIDERATIONS CONCERNING APPROACH LIGHTS
N. Iwataki and H. Kansaku Washington NASA Jan. 1973 26 p refs Transl. into ENGLISH from Ijitsu Hokoku (Japan), v. 7, no. 2, Oct. 1966 p 98-107
(Contract NASw-2481)
(NASA-TT-F-14667) Avail: NTIS HC $3.50 CSCL 17G

Approach lights serve the pilot, landing at night or in bad weather, as visual aids to his spatial judgment. Desirable properties of approach lights such as color, intensity, configuration, etc., are discussed from the viewpoint of visual perception with data from published, fundamental research and investigations. The color red is most desirable as an approach light considering visibility in several weather conditions, darkness adaptation, advance-retreat and swelling-contracting phenomenon, ability to discriminate from other lights at the airfield, and transmissivity of light through the atmosphere. The optimal intensity of light is related to the color of the light and the amount of glare. Stroboscopic light is effective for increased conspicuousness. Visual approach slope line indicator systems and a few others were determined to be superior to other configurations. Author

N73-17711*# TRW Systems Group, Redondo Beach, Calif.
DETAILED TEST PLAN REDUNDANT SENSOR STRAPDOWN IMU EVALUATION PROGRAM
T. Hartwell, Y. Miyatake, and D. E. Wedekind 29 Dec. 1971 129 p
(Contract NAS8-27335)
(NASA-CR-123513; TRW-18313-6003-RO-00) Avail: NTIS HC $8.50 CSCL 17G

The test plan for a redundant sensor strapdown inertial measuring unit evaluation program is presented. The subjects discussed are: (1) test philosophy and limitations, (2) test sequence, (3) equipment specifications, (4) general operating procedures, (5) calibration procedures, (6) alignment test phase, and (7) navigation test phase. The data and analysis requirements are analyzed. Author

N73-17712*# TRW Systems Group, Redondo Beach, Calif.
GENERAL TEST PLAN REDUNDANT SENSOR STRAPDOWN IMU EVALUATION PROGRAM
T. Hartwell, H. A. Irwin, Y. Miyatake, and D. E. Wedekind 8 Nov. 1971 125 p refs
(Contract NAS8-27335)
(NASA-CR-130722; TRW-18313-6002-RO-00) Avail: NTIS HC $8.25 CSCL 17G

The general test plan for a redundant sensor strapdown inertial measuring unit evaluation program is presented. The inertial unit contains six gyros and three orthogonal accelerometers. The software incorporates failure detection and correction logic and a land vehicle navigation program. The principal objective of the test is a demonstration of the practicability, reliability, and performance of the inertial measuring unit with failure detection and correction in operational environments. Author

N73-17713# California Univ., Livermore. Lawrence Livermore Lab.
DEVELOPMENT OF THE GEOGRAPHIC POSITION LOCATOR (GPL). VOLUME 1: SUMMARY Final Report
J. D. Salisbury 30 May 1972 35 p
(Contract W-7405-eng-48)
(UCRL-51130-Vol-1) Avail: NTIS

The Geographic Position Locator (GPL) is a small, self-contained unaided system for accurate, long-term, land-based inertial navigation. It uses the normal rest periods of land-based systems to reduce system errors and improve the subsequent navigational accuracy. Operation can be fully automatic, with a motion-state sensor activating the error-reduction process during stationary periods. Stored map information for automatic comparison with computed position, and selective response based on the comparison, also could be part of a fully-automated GPL system. Possible use of the GPL with nuclear weapons was the primary motivation of the program. The techniques developed,

however, apply to other navigation systems where the mission includes occasional stops and external references are unavailable. Author (NSA)

N73-17714# Sperry Rand Corp., Great Neck, N.Y. Gyroscope Div.
LORAN-D 400 FOOT ANTENNA MODIFICATION AND CONFIGURATION STUDY Final Report
Vincent Ruggiero Jul. 1972 258 p refs
(Contract F30602-71-C-0097)
(AD-751978; RADC-TR-72-146) Avail: NTIS CSCL 17/2

The original Loran-D Transmitter Station used a 300-foot tall transmitting antenna. The purpose of the project was to determine the increase in radiated power attainable by raising the antenna to 400 feet, and to determine if the 400-foot tower was designed, constructed, and erected, and various calculations and measurements were performed to determine its electrical characteristics. Author (GRA)

N73-17715# Ohio Univ., Athens. Dept. of Electrical Engineering.
ALL-WEATHER, LOW-LEVEL NAVIGATION AND IMPLEMENTATION OF A ONE-WAY RANGING, RANGE-RANGE NAVIGATION SYSTEM Semiannual Report, 10 Oct. 1971 - 10 Apr. 1972
Oct. 1972 99 p refs
(Contracts DAAB07-71-C-0156; DAAB07-68-C-0084)
(AD-752466; EER-16-16; ECOM-0084-5; SAR-5) Avail: NTIS CSCL 17/7

The report covers work on a LF prototype radio navigation system to provide a backup short-baseline navigation capability for Army aeronautical missions operating from ADF beacon stations. Pursuit of methods to reduce the cost of user equipment has led to the development of a digital receiver with the ability to tune within the LF band. This effort was supported by tradeoff comparison studies between analog and digital receiver methods, a direct-digital frequency synthesizer design for tuning purposes, digitally-tuned superheterodyne receiver techniques, CORDIC digital processor development for navigation coordinate conversion, and relative and absolute phase error analysis.
Author (GRA)

N73-17716# Southern Methodist Univ., Dallas, Tex. Information and Control Sciences Center.
AUTOMATIC NAVIGATION Final Report, 1 Sep. 1967 - 31 Aug. 1972
Andrew P. Sage Sep. 1972 58 p refs
(Contract F44620-68-C-0023; AF Proj. 9559)
(AD-751942; AFOSR-72-2169TR) Avail: NTIS CSCL 17/7

The report summarizes activities in optimization and estimation theory with applications to communication and control with special emphasis on automatic navigation. Author (GRA)

N73-17558 Joint Publications Research Service, Arlington, Va.
ERRORS IN MEASURING THE TURNING ANGLES OF A VEHICLE BY MEANS OF A THREE-AXIS GYROSTABILIZED PLATFORM CONSIDERING DRIFT
P. K. Plotnikov *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 1-7 refs (For availability see N73-17557 08-14)

N73-17561 Joint Publications Research Service, Arlington, Va.
PROBLEM OF RECKONING THE POSITION OF A VEHICLE IN GEOPOLAR REGIONS
K. G. Vakhitov *In its* Motion Studies of Gyro Instr. and Geopolar Meas. Errors 16 Jan. 1973 p 20-24 refs (For availability see N73-17557 08-14)

22 NUCLEAR ENGINEERING

Includes nuclear reactors and nuclear heat sources used for propulsion and auxiliary power. For basic research see: 24 Physics, Atomic, Molecular, and Nuclear. For related information see also: 03 Auxiliary Systems; and 28 Propulsion Systems.

N73-17717*# Thermo Electron Corp., Waltham, Mass.
PERFORMANCE TESTS OF A THERMIONIC CONVERTER WITH AN OXYGENATED CESIUM RESERVOIR Final Report
B. Gunther, D. Lieb, T. Pigford, and F. Rufeh Jul. 1972 57 p refs
(Contract NAS3-14413)
(NASA-CR-121119; TE-4144-14-73) Avail: NTIS HC $5.00 CSCL 18L

Cesium oxide/cesium solutions as a possible source of oxygen and cesium are investigated. A converter-reservoir system which allows multiple additions of oxygen with intervening thermionic performance tests was developed. The experimental data cover the cesium oxide mole fraction range of 0 to 0.018 with thermionic performance measurements in the emitter temperature range of 1600 to 1900 K. The data showed that the thermionic performance was unaffected by the presence of cesium oxide in this mole fraction range and higher mole fractions appear to be required for the proper oxygen arrival rate at the emitter surface. Author

N73-17718*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
FISSION-GAS RELEASE FROM URANIUM NITRIDE AT HIGH FISSION RATE DENSITY
Michael B. Weinstein, Thomas A. Kirchgessner, and Thomas N. Tambling Washington Mar. 1973 57 p refs
(NASA-TN-D-7171; E-7097) Avail: NTIS HC $3.00 CSCL 18G

A sweep gas facility has been used to measure the release rates of radioactive fission gases from small UN specimens irradiated to 8-percent burnup at high fission-rate densities. The measured release rates have been correlated with an equation whose terms correspond to direct recoil release, fission-enhanced diffusion, and atomic diffusion (a function of temperature). Release rates were found to increase linearly with burnups between 1.5 and 8 percent. Pore migration was observed after operation at 1550 K to over 6 percent burnup. Author

N73-17719# Commissariat a l'Energie Atomique, Bruyeres-le-Chatel (France). Centre d'Etudes Nucleaires.
PEACEFUL APPLICATIONS OF NUCLEAR EXPLOSIONS: MINES, CHEMISTRY, AND GAS AND OIL EXTRACTION
Micheline C. Berton Aug. 1972 285 p refs Partly in ENGLISH; mostly in FRENCH
(CEA-Bib-129-Add-1) Avail: AEC Depository Libraries

This bibliography is complementary to the bibliography CEA-BIB-129 written in 1968. It comprises 788 references covering principally the following domains: Nuclear Science Abstracts; Government Research Abstracts; Scientific and Technical Aerospace Reports; Bulletin Signaletique of the C.N.R.S.; Index de la Litterature Nucleaire Francaise; and Reports and books of the Central Library of Saclay. The documents are presented in a number of chapters indicated in a subject index table. Several indexes appear at the end of the bibliography: authors index, index of reports, index of review articles, index of congresses, index of books, and a patents index. NSA

N73-17720# Zentralstelle fuer Atomkernenergie-Dokumentation, Leopoldshafen (West Germany).
BIBLIOGRAPHIES IN NUCLEAR SCIENCE AND TECHNOLOGY. SECTION 21: DOSIMETRY. NUMBER 10: ELECTROMETRIC METHODS
Klaus Becker, comp. Aug. 1972 154 p refs In several languages
(AED-C-21-10) Avail: AEC Depository Libraries

A list of 2571 references from Nuclear Science Abstracts (NSA) from 1964 to 1970 is presented. They are categorized according to conferences, dissertations, patents, reports, journal articles, and monograms. An author and a subject index are included. NSA

N73-17721# California Univ., Livermore. Lawrence Livermore Lab.
SOME PROBLEMS ASSOCIATED WITH TRITIUM IN FUSION REACTORS
Robert G. Hickman 1 Aug. 1972 5 p Presented at Intern. Meeting on the Technol. of Controlled Thermonucl. Fusion Expt.

and the Eng. Aspects of Fusion Reactors, Austin, Tex., 20 Nov. 1972 Sponsored by AEC
(UCRL-74057; Conf-721111-2) Avail: NTIS

A number of problems associated with the use of tritium in fusion reactors are yet to be addressed. Some are peculiar to mirror machines and attempts at direct conversion of plasma energy to electricity, while others are of general concern. Several of these are considered from the point of view of one who has worked with tritium for several years. Specific areas mentioned include liquid phase mass transfer of tritium in liquid lithium, isotopic separation, preliminary calculations on permeation barriers, isotopic swamping, and some thoughts on maintenance. Author (NSA)

23 PHYSICS, GENERAL

Includes acoustics, cryogenics, mechanics, and optics. For astrophysics see: 30 Space Sciences. For geophysics and related information see also: 13 Geophysics, 20 Meteorology; and 29 Space Radiation.

N73-17722*# Texas A&M Univ., College Station. Dept. of Physics.
INTERIOR RADIANCES IN OPTICALLY DEEP ABSORBING MEDIA. 1: EXACT SOLUTIONS FOR ONE-DIMENSIONAL MODEL
George W. Kattawar and Gilbert N. Plass 3 Jan. 1973 38 p refs
(Grant NGR-44-001-117)
(NASA-CR-130755; Rept-5) Avail: NTIS HC $4.00 CSCL 20F

The exact solutions are obtained for a one dimensional model of a scattering and absorbing medium. The results are given for both the reflected and transmitted radiance for any arbitrary surface albedo as well as for the interior radiance. These same quantities are calculated by the matrix operator method. The relative error of the solutions is obtained by comparison with the exact solutions as well as by an error analysis of the equations. The importance of an accurate starting value for the reflection and transmission operators is shown. A fourth order Runge-Kutta method can be used to solve the differential equations satisfied by these operators in order to obtain such accurate starting values. Author

N73-17723# Technischen Universitaet, Munich (West Germany). Fakultaet fuer Maschinenwesen und Elektrotechnik.
NON-THERMICAL ELECTRON DENSITY FLUCTUATIONS IN A MAGNETIC FIELD STABILIZED HYDROGEN ARC Ph.D. Thesis [NICHTTHERMISCHE ELEKTRONENDICHTEFLUKTUATIONEN IN EINEM MAGNETFELDSTABILISIERTEN WASSERSTOFFBOGEN]
Dieter Ludwig 1972 56 p refs In GERMAN
Avail: NTIS HC $5.00

Thermal scattering in a hydrogen arc laser is studied by Fabry-Perot interferometer. Hyperfine line structure deviations from theoretical scattering analysis indicate a non-thermal fluctuation effect caused by oscillating electron propagation and subsequent frequency modulation. Transl. by G.G.

N73-17724*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPERATIONAL FREQUENCY STABILITY OF RUBIDIUM AND CESIUM FREQUENCY STANDARDS
John E. Lavery Washington Mar. 1973 16 p refs
(NASA-TN-D-7063; G-1083) Avail: NTIS HC $3.00 CSCL 14B

The frequency stabilities under operational conditions of several commercially available rubidium and cesium frequency standards were determined from experimental data for frequency averaging times from 10 to the 7th power s and are presented in table and graph form. For frequency averaging times between 10 to the 5th power and 10 to the 7th power s, the rubidium standards tested have a stability of between 10 to the minus 12th power and 5 x 10 to the minus 12th power, while the cesium standards have a stability of between 2 x 10 to the minus 13th power and 5 x 10 to the minus 13th power. Author

N73-17725# National Bureau of Standards, Boulder, Colo.
A PRELIMINARY INVESTIGATION OF THE BEHAVIOR OF HIGH PURITY COPPER IN HIGH MAGNETIC FIELDS Annual Report
F. R. Fickett Jun. 1972 71 p refs Supported by the Intern. Copper Res. Assoc.
(Incra Proj. 186)
(U-235) Avail: NTIS HC $5.75

Internal oxidation of impurities in pure copper by oxygen annealing is a viable technique for lowering the low temperature (4 K) resistivity by a significant amount. Residual resistance ratio (RRR) values of 6000-7000 can be obtained in polycrystalline wires. At low temperatures, the resistivity of copper increases almost linearly with increasing magnetic field. This is true for a range of purity of 200 less than RRR less than 7000 and for a range of temperature 4 K less than T less than 35 K which represents the largest range of these quantities ever measured. These increases may be large - the highest purity measured at 4 K gave a resistivity increase at 100 kOe of a factor of almost 120. The value of the resistivity at any field and at any temperature can be accurately predicted by a simple equation. The only necessary input to the equation is the zero field resistivity at that temperature. Evaluation of the data shows that, for high field use at low temperature, there is little to be gained in the way of decreased resistivity by purification much above RRR = 2000. While the resistivity at high field and low temperature is significantly higher than that of aluminum of the same purity, the increased strength and simpler metallurgy of copper make it still an attractive metal for low temperature electrical use. Author

N73-17726*# Translation Consultants, Ltd., Arlington, Va.
RADIATION AND PROPAGATION OF ELECTROMAGNETIC WAVES IN AN ANISOTROPIC MEDIUM
A. I. Potekhin Washington NASA Feb. 1973 67 p refs Transl. into ENGLISH of "Izlucheniye i Rasprostraneniye Elektromagnitnykh voln v Anizotropnoy Srede" Nauka Press, Moscow, 1971
(Contract NASw-2038)
(NASA-TT-F-743) Avail: NTIS HC $3.00 CSCL 20N

Problems concerned with the propagation of electromagnetic waves in a uniaxial anisotropic medium radiated by a current-carrying plate, an infinitely long filament, or by an elementary dipole are discussed systematically. Rigorous methods are used to calculate the field at any distance from the source. The orientation of the axis of the current-carrying filament, or of the dipole axis, is assumed parallel, or perpendicular, to the axis of anisotropy. All problems are solved by a unique method that leaves the physical sense clear at all stages of calculation. The answer is provided in closed form for all cases considered (plane, cylindrical, conical, and quasi-spherical waves). Author

N73-17727# Max-Planck-Institut fuer Physik und Astrophysik, Munich (West Germany).
THE MODEL MEDIUM CONCEPT AS A BASIS FOR GEOMETRIC OPTICS
L. R. O. Storey Jun. 1972 88 p refs Presented at the Symp. on Plasma Waves, Instabilities, and Interactions, Spatind, Norway, Apr. 1972
(MPI-PAE/Extraterr-60) Avail: NTIS HC $6.50

In a wave propagation study of nondispersive transparent media, geometric optics is defined as the limit of Fourier optics at infinite frequency. This definition is extended to dispersive media by introducing the concept of model medium. When applied to transparent media, the model medium concept yields the standard theorems of geometric optics. It can also be applied to absorbing media. It is used to derive the general expression for the ray direction. Author (ESRO)

N73-17728# Institut Franco-Allemand de Recherches, St. Louis (France).
ARC DISPLACEMENT BY ASYMMETRICAL ARC HEATING USING PULSED HIGH FREQUENCY RADIATION Ph.D. Thesis - Tech. Univ. Munich [VERLAGERUNG EINES LICHTBOGENS DURCH UNSYMMETRISCHE AUFHEIZUNG

DER BOGENSAEULE MITTELS GEPULSTER HOCHFREQUENZSTRAHLUNG]
M. Schwertl Bonn Bundeswehramt 1972 101 p refs In GERMAN; ENGLISH summary Sponsored by Bundesmin. der Verteidigung
(BMVg-FBWT-72-19) Avail: NTIS HC $7.25; Bundeswehramt 25 DM

A low current wall stabilized argon arc was heated unsymmetrically by means of pulsed high frequency radiation, and its displacement was studied. A pulsed magnetron was used for the heating. The arc was located at a distance d in front of the waveguide. The displacement was measured by a sampling method as a function of the arc current J, the HF radiation P, and the distance d. The effects which occurred are explained by means of the variation of voltage and light intensity of the arc with irradiation. The amount and the distribution of the absorbed HF power was calculated by solving the energy balance for an adequate model. ESRO

N73-17729# Massachusetts Inst. of Tech., Cambridge. Research Lab. of Electronics.
[RESEARCH PROGRESS IN GENERAL AND PLASMA PHYSICS AND COMMUNICATION SCIENCES AND ENGINEERING] Progress Report
H. J. Zimmermann, G. G. Harvey, and S. J. Mason 15 Oct. 1972 131 p refs
(Contract DAAB07-71-C-0300)
(AD-751213; QPR-107) Avail: NTIS CSCL 05/2

Contents: Molecular beams; Microwave spectroscopy; Radio astronomy; Electrodynamics of media; Plasmas and controlled nuclear fusion; Gaseous electronics; Relativistic beams; Applied plasma research; Processing and transmission of information; Detection and estimation theory; Speech communication; Communications biophysics. GRA

N73-17730# Honeywell, Inc., Bloomington, Minn. Corporate Research Center.
PREPARATION AND CHARACTERIZATION OF POLYCRYSTALLINE HALIDES FOR USE IN HIGH POWER LASER WINDOWS Quarterly Technical Report, 1 Jul. - 30 Sep. 1972
G. E. Bernal, R. J. Stokes, B. G. Koepke, and R. H. Anderson 15 Oct. 1972 65 p refs
(Contract DAHC15-72-C-0227; ARPA Order A02172)
(AD-751655; HR-72-286:5-26; QTR-2) Avail: NTIS CSCL 20/6

The mechanisms of high temperature deformation of alkali halides are reviewed. It is shown that at high temperatures it is possible to deform these materials to an arbitrary shape without void formation. The practical implementation of methods for hot working halides to produce strengthened polycrystalline bodies are described. The mechanical, microstructural and optical properties of polycrystalline potassium chloride produced are presented. The mechanical strength of the polycrystalline material is about 8 times higher than that of the single crystal. A stable microstructure of approximately 5 micrometers diameter grains can be produced. However, excessive deformation can produce abnormal grain growth at room temperature. The optical absorption of the hot worked materials is essentially unchanged from that of the starting single crystals. Some results of interferometric measurements of laser-induced deformation are presented. An expression for the temperature rise produced by irradiation of a low absorption sample by a laser beam is given. Author (GRA)

N73-17731# HRB-Singer, Inc., State College, Pa.
DIGITAL PROCESSING OF IR SCANNER VIDEO Final Report, May - Nov. 1972
Clifford P. Bastuscheck Nov. 1972 51 p
(Contract N00014-71-C-0296; NR Proj. 387-057)
(AD-752069; HRB-4567-F) Avail: NTIS CSCL 17/5

Infrared line-scan video signals, collected during four flights in early summer, were digitally processed and compared with the video data collected during a similar flight in February. The distributions of apparent temperatures were compared to determine whether the diurnal effects were similar for the two seasons and whether the presence of activity in the target areas studied could be discerned through the seasonal and diurnal effects. Small changes in activity were not readily detected, but relatively large changes produced reliable indications in the processed data. Author (GRA)

N73-17732# Arizona Univ., Tucson. Optical Sciences Center.
PROPERTIES OF OPTICAL DESIGN MODULES
Romeo I. Mercado Jun. 1972 69 p refs
(Contract F44620-69-C-0024; AF Proj. 7921)
(AD-751964; OSC-TR-75; AFOSR-72-2189TR) Avail: NTIS CSCL 20/6

Optical design modules are defined as a class of two-surface optical systems with fixed focal lengths and having the property that, relative to a pair of conjugate planes, one finite and the other infinite, the third-order spherical aberration is zero. It is shown that parameters derivable from the Delano (y, y bar) diagram form a convenient set of independent parameters that completely describe and define some of the general properties of design modules. Such representations were found to yield insights in the analysis of modules that cannot readily be obtained using better known methods. GRA

N73-17733# Stanford Univ., Calif. Microwave Lab.
INVESTIGATION OF ELECTRONICALLY TUNABLE OPTICAL FILTERS Annual Report, 1970
Dec. 1970 14 p refs
(Contract N00014-67-A-0112-0036; NR Proj. 016-106)
(AD-752052; ML-1917) Avail: NTIS CSCL 20/6

Work has been aimed at the construction of a transmission version of the collinear electronically tunable acousto-optic filter, a study of its aperture characteristics, and the investigation of possibilities of its use to construct an electronically tunable laser. A separate paper is included, titled: CaMoO4 Electronically Tunable Optical Filter. GRA

N73-17734# Aerophysics Research Corp., Bellevue, Wash.
ARCTIC SITE SURVEY Technical Report, 1 Jul. - 15 Nov. 1972
T. S. Chow 7 Nov. 1972 13 p refs
(Contract N00014-72-C-0335; ARPA Order 1779)
(AD-752056) Avail: NTIS CSCL 20/1

The following topics are discussed: Ray tracing in the Arctic Ocean; Velocity profile from temperature and salinity data; Arctic topography; Corrections to ray acoustics; Subcontract work to Lamont-Doherty. GRA

N73-17735# Meteorology International, Inc., Monterey, Calif.
REFINEMENTS FOR PRECLUDING THE FORMATION OF SPURIOUS CAUSTICS IN A SOUND MAPPING SCHEME FOR SINGLE SOUND-SPEED PROFILE, FLAT-BOTTOM REGIONS
Manfred M. Holl Oct. 1972 56 p
(Contract N00014-72-C-0484; NR Proj. 292-094)
(AD-752080; M-187) Avail: NTIS CSCL 20/1

Ray tracing is much in use for mapping sound propagation in the sea. The sound mapping produces an intensity-ratio distribution, as an emanation from a given location, computed over a directed vertical section. The mapping can be exploited as the field of listening coverage for a receiver at a location, or as the field of insonification produced by a source at the same location. The authors address the ray-tracing schemes which advance rays by progression in depth, from one specified depth to the next, based on a linear variation in sound speed in each incremental depth advancement. These schemes have the advantage of computational speed, but do produce spurious caustics as they now stand unrefined. The report develops in detail a refinement for precluding the formation of spurious caustics in sound mapping in the realm of a single sound-speed profile, flat-bottom region. GRA

N73-17736# Stanford Univ., Calif. Microwave Lab.
MICROWAVE RESEARCH Annual Status Report, 1 Jun. 1971 - 31 May 1972
Oct. 1972 80 p refs
(Contract N00014-67-A-0112-0039; NR Proj. 373-361)
(AD-752055; SU-ML-2060; ASR-5) Avail: NTIS CSCL 05/2

Contents: Acoustic pumping of fluids; Fuel cell research; Dielectric loss in polymers; Signal processing via surface acoustic waves; Monolithic surface wave amplifiers; Tunable Raman laser;

Acoustic properties of materials, Acoustic methods for cell discrimination; Gunn effect traveling wave amplifiers; Large time bandwidth surface wave delay lines. GRA

N73-17737# California Inst. of Tech., Pasadena. Div. of Engineering and Applied Science.
SPECKLE REDUCTION USING MULTICOLOR ILLUMINATION Interim Report
Nicholas George and Atul Jain May 1972 46 p refs
(Grant AF-AFOSR-2234-72; AF Proj. 9768)
(AD-752240; AFOSR-72-1308TR; SR-14) Avail: NTIS CSCL 20/6

The occurrence and the smoothing of speckle are studied as a function of the linewidth of an illuminating source. A general theory is presented for speckling in the image of a partially diffuse, phase-type of object which has a variable number of random scattering centers per resolution element. Then, an expression is derived for the wavelength spacing which is required to decouple the speckle patterns arising from two monochromatic tones in an imaging system, thereby establishing that it is feasible to smooth speckle using multi-color illumination. This theory is verified in a series of experiments using both laser illumination and band-limited light from a carbon-arc. For an imaged diffuser, it is shown that speckle appears laser-like for highly collimated sources even up to line-widths of 5A. Then, smoothing of speckle is demonstrated in the imaging both of a diffuser and for a section of an optic nerve when the illumination is provided by six monochromatic tones each spaced by 300A. Since with panchromatic viewing the speckle smooths, a direct extension of this method to holographic microscopy, using a multi-tone laser, should permit one to record and reconstruct holograms of diffraction limited resolution which are essentially speckle-free.
Author (GRA)

N73-17738# Texas Univ., Austin. Electronics Research Center.
ACOUSTIC SELF-DEMODULATION OF PREDISTORTED PULSED CARRIERS
B. A. Davy and E. L. Hixson 1 Mar. 1972 67 p refs
(Contract F44620-71-C-0091; AF Proj. 4751)
(AD-752237; TR-121; AFOSR-72-0654TR) Avail: NTIS CSCL 20/1

Nonlinear effects cause demodulation of a pulsed carrier such that a signal proportional to the second time derivative of the square of the pulse envelope develops in the insonified medium. If the pulse envelope function is predistorted by time integrating it twice and taking its square root, the resulting pulsed carrier should demodulate into the original envelope function. Several different types of pulse envelopes were used to modulate a 450 kHz carrier in order to verify the self-demodulation phenomenon. The pulse envelopes were then predistorted (integrated twice and square rooted) and used to modulate the carrier which then drove a 3 inch diameter circular piston projector. The transmission medium was water. In all experiments, a low pass filter was used to absorb the carrier frequency. The self-demodulation phenomenon was experimentally demonstrated for several envelope pulse shapes. When the pulses were predistorted, the original pulse envelope was recovered within the bandwidth limitations of the transmitter and receiver.
Author (GRA)

N73-17739# New York Univ., N.Y. Geophysical Sciences Lab.
MEASUREMENT OF THE ROUGHNESS AND DIRECTIONAL PROPERTIES OF THE OCEAN SURFACE IN SUPPORT OF THE NRL LOW FREQUENCY UNDERWATER SOUND SURFACE-SCATTERING EXPERIMENT OP. 70-01-04
R. Alfred Saenger Aug. 1972 231 p refs
(Contract N00014-67-A-0467-0012)
(AD-752065; GSL-TR-72-6) Avail: NTIS CSCL 20/1

In the midsummer of 1970 NRL performed at low frequency underwater sound surface-scattering experiment in the Pacific at 38 degrees N, 161 W. During the course of the experiment measurements of the vertical acceleration and orthogonal slopes of a typical patch of ocean surface were made with an improved VARPMAG float system sensitive to gravity wave components with frequencies up to about 1 Hz. The purpose of this report is to provide surface roughness and directionality information which will be of use in constructing a scattering model for the acoustic observations. Author (GRA)

24 PHYSICS, ATOMIC, MOLECULAR, AND NUCLEAR

Includes atomic, molecular and nuclear physics. For applications see: 22 Nuclear Engineering. For related information see also: 29 Space Radiation.

N73-17740# Technischen Universitaet, Munich (West Germany).
APPLICATION OF ANGULAR OVERLAP MODEL FOR INTERPRETING MAGNETIC PROPERTIES OF COORDINATION COMPOUNDS WITH UNPAIRED 5F ELECTRONS Ph.D. Thesis [ZUR ANWENDBARKEIT DES ANGULAR OVERLAP-MODELLS BEI DER DEUTUNG MAGNETISCHER EIGENSCHAFTEN VON KOORDINATIONSVERBINDUNGEN MIT UNGEPAARTEN 5F-ELEKTRONEN]
Hanns-Dieter Amberger 16 May 1972 155 p refs In GERMAN
Avail: NTIS HC $9.75

The angular overlap model is used in quantitative analyses on line spectra for solid compounds and organometallic molecular complexes of the actinide elements. General valid functions are developed that utilize two center exchange effects of the pi and delta type between the f-orbital of the central atom and the corresponding ligand orbitals to describe crystal field diffraction patterns in an arbitrary f to the nth power configuration as function of the angular overlap model parameter e sub lambda.
Transl. by G.G.

N73-17741# Technischen Universitaet, Munich (West Germany).
APPLICATION OF SEMI-EMPIRICAL ALL-VALENCE ELECTRON METHOD FOR CALCULATING PHOTOELECTRON- AND ABSORPTION-SPECTRA Ph.D. Thesis [ZUR ANWENDUNG SEMIEMPIRISCHER ALLVALENZ- ELEKTRONEN-VERFAHREN FUER DIE BERECHNUNG VON PHOTOELEKTRONEN-UND ABSORPTIONSSPEKTREN]
Detlef Boesser 14 Jul. 1972 189 p refs In GERMAN
Avail: NTIS HC $11.50

Semi-empirical valence electron model calculations are used to interpret photoelectron spectra for the two to three smallest, ionization energies in atomic complexes of the first two rows of the periodic system with an error of less than 1 eV. It is possible to describe with this method the shifts in the photoelectron spectrum of a homological series (BF3, NF3, PF3, and AsF3) quantitatively accurate and also to calculate incorporated heavy atoms by simple parameter approximation. This method is only successful when molecular orbitals are mainly determined by ligand electrons and when the ligand does not belong to a higher group in the periodic system. The calculation of excited levels using localized SCF orbitals is demonstrated on compounds containing oxygen and nitrogen. Transl. by G.G.

N73-17742# Defence Research Establishment Valcartier (Quebec).
SYNTHESIS OF THE (A 2 SIGMA PLUS) TO (X 2 PI) BANDS OF OH AND THE (a 1 DELTA g) TO (X 3 SIGMA g MINUS) BANDS OF O2
G. B. Spindler Nov. 1972 39 p refs
(Proj. 95-10-42)
(DREV-TN-2012/72) Avail: NTIS HC $4.00

A brief description of theory required for synthesis of selected electronic bands in OH and O2 is given. The nature of the electronic transitions, rotational branch structure, and rotational line strengths are discussed. A few examples of experimental and synthetic band envelopes are shown. Branch structure of unobserved electronic and vibration-rotation transitions in oxygen are also shown, and wavelengths for some such forbidden lines are calculated. Author

N73-17743*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ASYMPTOTIC FORM FOR THE CROSS SECTION FOR THE COULOMB INTERACTING REARRANGEMENT COLLISIONS
K. Omidvar Feb. 1973 10 p refs Submitted for publication
(NASA-TM-X-66184; X-641-73-38) Avail: NTIS HC $3.00 CSCL 20H

It is shown that in a rearrangement collision leading to the formation of the highly excited hydrogenlike states the cross section in all orders of the Born approximation behaves as

1/n sq, with n the principal quantum number, thus invalidating the Brinkman-Kramers approximation for large n. Similarly, in high energy inelastic electron-hydrogenlike atom collisions the exchange cross section for sufficiently large n dominates the direct excitation cross section. Author

N73-17744*# Scientific Translation Service, Santa Barbara, Calif.
KINETIC BEHAVIOR OF PROTONS AND DEUTERONS IN ICE CRYSTALS
M. Eigen, L. DeMaeyer, and H.-Ch. Spatz Washington NASA 15 Feb. 1973 34 p refs Transl. into ENGLISH from Ber. Bunsenges. (West Ger.), v. 68, no. 1, 1964 p 19-29
(Contract NASw-2483)
(NASA-TT-F-14692) Avail: NTIS HC $3.75 CSCL 20H

It is shown that the thermodynamic and kinetic parameters of the reversible reaction H(+) + OH(-) in ice can be obtained by combination of three methods. These are measurement of dc conductivity, measurement of the saturation current, and determination of the dissociation field effect. The absolute value and the temperature coefficient of the dc conductivity were evaluated by measurements on ice crystals of very pure H2O and D2O. The dissociation field effect could be observed as a deviation from the saturation current at very high field intensities. Earlier measurements on H2O ice are largely confirmed. The measurements on D2O ice show very large isotope effects. These are discussed with reference to the zero-point energy differences of the valency vibrations of protons and deuterons. Author

N73-17745*# Scientific Translation Service, Santa Barbara, Calif.
RECOILLESS RESONANCE ABSORPTION BY THE 6.2 keV STATE IN Ta-181
Christian Sauer Washington NASA 16 Feb. 1973 25 p refs Transl. into ENGLISH from Z. Phys. (West Germany), v. 222, 1969 p 439-454
(Contract NASw-2483)
(NASA-TT-F-14680) Avail: NTIS HC $3.25 CSCL 18H

A strong recoilless resonance absorption was observed for the extraordinarily narrow 6.2 keV level (half life = 6.8 microsec) of Ta-181. Using sources of W-181 in W-metal and Ta-metal absorbers, a linewidth of about 9 times the natural width was obtained, with an enormous isomer shift of +(0.85 + or - 0.02)mm/sec, which is equivalent to a shift by 260 times the natural linewidth. Recoilless resonance spectra of cold worked and of oxygen doped absorbers showed a high sensitivity of the linewidth against lattice imperfections due to inhomogeneous quadrupole interactions and isomer shifts. Measurements of the residual resistivity ratio and of the lattice constant of the impurity doped absorbers yielded a linear correlation between linewidth and isomer shift. Author

N73-17746*# General Electric Co., Schenectady, N.Y.
ABSOLUTE INTENSITY AND POLARIZATION OF ROTATIONAL RAMAN SCATTERING FROM N2, O2, AND CO2
C. M. Penney, R. L. St.Peters, and M. Lapp Jan. 1973 89 p refs
(Contract NAS3-15825)
(NASA-CR-121091; SRD-72-163) Avail: NTIS HC $6.50 CSCL 20H

An experimental examination of the absolute intensity, polarization, and relative line intensities of rotational Raman scattering (RRS) from N2, O2, and CO2 is reported. The absolute scattering intensity for N2 is characterized by its differential cross section for backscattering of incident light at 647.1 nm, which is calculated from basic measured values. The ratio of the corresponding cross section for O2 to that for N2 is 2.50 plus or minus 5 percent. The intensity recent for N2, O2, and CO2 are shown to compare favorably to values calculated from recent measurements of the depolarization of Rayleigh scattering plus RRS. Measured depolarizations of various RRS lines agree to within a few percent with the theoretical value of 3/4. Detailed error analyses are presented for intensity and depolarization measurements. Finally, extensive RRS spectra at nominal gas temperatures of 23 C, 75 C, and 125 C are presented and shown to compare favorably to theoretical predictions. Author

N73-17747*# California Univ., Berkeley. Space Sciences Lab.
ENERGETIC PARTICLE FLUX EXPERIMENT (IMP-F AND G) Final Technical Report, 28 Jan. 1965 - 30 Jun. 1971
Kinsey A. Anderson 12 Dec. 1972 263 p ref
(Contract NAS5-9091)
(NASA-CR-130172) Avail: NTIS HC $15.25 CSCL 20H

The technical aspects of the University of California IMP-F experiment aboard the Explorer-34 and the University of California IMP-G (S1) and (S2) experiments aboard the Explorer-41. The experiment detectors and electronics are discussed for each experiment as well as the fabrication, preflight and post-flight history. A description of the ground support equipment is also given for each experiment. These three experiments were essentially all different. The IMP-G experiment was essentially the IMP-F experiment with the addition of four Geiger-Mueller detectors. The IMP-G (S-2) was a supplementary experiment and differed completely from the IMP-F and IMP-G experiments. It was concluded that the ground support equipment approach used for the IMP-F and IMP-G experiments where emphasis wac placed on a thorough exercise and monitoring of the experiment operation during various testing phases provided a high degree of confidence and reliability in these experiments. No known electronic failures have occurred during the spacecraft lifetime although some detector problems were experienced. Author

N73-17748*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECTS OF WALL COATINGS AND TEMPERATURE ON HYDROGEN ATOM SURFACE RECOMBINATION
Edgar L. Wong and Charles E. Baker Washington Mar. 1973 17 p refs
(NASA-TM-X-2735; E-7161) Avail: NTIS HC $3.00 CSCL 20H

The efficiency of various surface coatings and materials toward inhibiting hydrogen atom surface recombination was investigated over a temperature range of 77 to 298 K. A flow discharge, mass spectrometer technique was used to make the experimental measurements. Hydrogen atoms were monitored directly, and these measurements were expressed as ratios of mass spectrometer peak heights for atomic and molecular hydrogen. Several of the surface coatings studied were efficient at reducing hydrogen atom surface recombination at room temperature. However, as the temperature was lowered, this efficiency was drastically reduced. Calibration of the mass spectrometer for atomic and molecular hydrogen indicated that mass spectrometer discrimination against hydrogen atoms was severe. Mass spectrometer sensitivity for hydrogen atoms was only about one-sixth of that for molecular hydrogen. Author

N73-17749# Institut fuer Chemie der Treibstoffe, Berghausen (West Germany).
BIBLIOGRAPHY ON NUCLEAR BURST EFFECTS ON EXPLOSIVES [BIBLIOGRAPHIE UEBER EINWIRKUNGEN VON KERNEXPLOSIONEN AUF EXPLOSIVSTOFFE]
G. Kistner 31 Dec. 1971 128 p refs In GERMAN
(ICT-11/71) Avail: NTIS HC $8.50

A bibliography on the effects of nuclear explosions on explosives is presented. Reports on blast and shock wave effects, nuclear, thermal, and X-ray radiation and atomic bomb explosions are included, as well as literature on tests carried out in nuclear reactors. ESRO

N73-17750# Lund Univ. (Sweden). Dept. of Physics.
PHOTOMETRIC TRACK WIDTH - VELOCITY RELATIONS FOR HEAVY IONS IN ILFORD G5 NUCLEAR EMULSIONS
L. Larsson, R. Andersson, and O. Mathiesen Nov. 1972 25 p refs Sponsored in part by Swed. Atom Res. Council and Swed. Nat. Res. Council
(LUIP-CR-72-13) Avail: NTIS HC $3.25

The relation between the photometrically determined track width, W, and the velocity, beta, of some heavy ions with charge numbers Z = 14, 16, 24 and 26 has been established in Ilford G5 nuclear research emulsions. It was found that in the velocity interval studied, 0.40 < or = beta < or = 0.83, the relation between W, Z and beta can be approximately written W(beta, Z) = WO(Z) beta to the minus alpha (Z) power. The numerical value of alpha (Z) is about one. From the empirical function W(beta, Z) its range of charge along the track is derived. ESRO

N73-17751# Aerospace Corp., El Segundo, Calif. Lab. Operations.
QUENCHING OF VIBRATIONALLY EXCITED N2 BY ATOMIC OXYGEN Technical Report, Feb. - Jun. 1972
Robert J. McNeal, Milo E. Whitson, Jr., and Gilbert R. Cook 1 Oct. 1972 19 p refs
(Contract F04701-72-C-0073)
(AD-752542; TR-0073(9260-01)-3; SAMSO-TR-72-278) Avail: NTIS CSCL 07/4

A recently developed photoionization technique for detection of vibrationally-excited nitrogen (N2) has been applied to a study of the quenching of N2 by O at 300 K. The rate coefficient for quenching of N2 by O was found. The efficient vibrational relaxation previously observed in the N2 - O system in shock tubes at high temperatures and attributed to a chemical interaction persists at low temperatures. Author (GRA)

25 PHYSICS, PLASMA

Includes magnetohydrodynamics. For applications see: 28 Propulsion Systems.

N73-17752 Tennessee Univ., Knoxville.
NONEQUILIBRIUM IONIZATION PHENOMENA IN A GAS PARTICLE PLASMA Ph.D. Thesis
Richard Vair Shanklin, III 1971 119 p
Avail: Univ. Microfilms Order No. 72-15548

A theoretical one dimensional study was performed examining a continuously expanding gas particle flow through a converging-diverging nozzle. The flow leaving the nozzle subsequently was assumed to enter a duct having a much smaller area expansion rate. The geometry of the nozzle and duct corresponded to that for the experimental program. The electrical conductivity of the mixture was calculated taking into account the elevation of electron temperature over that of the gas due to the presence of hot, thermionically emitting solid particles. The results showed that the effect of the hot, emitting particles on the electron temperature was negligible although the effect increased with decreasing system pressure. It was found also that by increasing the assumed size of the particles the gas temperature and electrical conductivity could be made to increase within the confines of the low expansion duct. Dissert. Abstr.

N73-17753 Minnesota Univ., Minneapolis.
OBSERVATIONS OF PLASMA WAVES GENERATED BY A BEAM OF ELECTRONS IN THE IONOSPHERE Ph.D. Thesis
David Geoffrey Cartwright 1971 146 p
Avail: Univ. Microfilms Order No. 72-14280

A controlled experiment on wave particle interactions in the ionosphere has been made. Pulses of electrons with 40 KV energy and 70 mA intensity were emitted from a rocket-borne accelerator and injected into the earth's magnetic field with pitch angles near 90 deg. Emissions were detected at frequencies near the plasma frequency of the ionospheric electrons, near the second harmonic of the electron cyclotron frequency, in the whistler mode, and near the lower hybrid resonance frequency of the background ionosphere. Calculations show that not all of the emission features can be accounted for by incoherent processes, so that some coherent emission or instabilities may be required to fully explain the observations. Dissert. Abstr.

N73-17754# Nagoya Univ. (Japan). Inst. of Plasma Physics.
HEATING OF HIGH z PLASMA BY LASER
H. B. Kang, T. Yamanaka, M. Waki, K. Yoshida, Y. Sakagami, and C. Yamanaka Oct. 1972 36 p refs Submitted for publication
(IPPJ-142) Avail: NTIS HC $4.00

The properties of plasmas produced by high power laser were investigated. The laser beam irradiated various targets of beryllium, carbon and polyethylene of high z number. The influence of the charge number z to the heating of the plasma is discussed. The electron temperatures of plasmas from different targets were estimated by the measurement of soft X-ray. The time variations of the reflected laser light from plasma were also investigated. From the time of flight measurements with a Faraday cage and an electrostatic energy analyser, the different charged ions could be separated and ion temperatures and drift velocities were obtained from their velocity profiles. No influence of laser pulse duration to the temperature was observed in the cases of durations 2, 4 and 10 nanoseconds. The experimental results for a fast rising laser pulse are discussed and compared with those for a slow rising one. Author

N73-17755# Nagoya Univ. (Japan). Inst. of Plasma Physics.
GENERATION OF ENERGETIC ELECTRONS BY ELECTRON CYCLOTRON HEATING IN A MAGNETIC MIRROR FIELD
Hideo Kegami, Shuko Aihara, Minol Hosokawa, and Hiroshi Aikawa Sep. 1972 40 p refs
(IPPJ-140) Avail: NTIS HC $4.00

Electron cyclotron heating that generates hot-electron plasma in a magnetic mirror trap by microwaves is studied experimently. Evolution of energy distribution functions for the high energy electron is observed in each successive 1 microsecond during a 200 microsecond heating period from the initial stage at the microwave power input until the stationary, final state. According to the proposed statistical model for the cyclotron heating, heating rates are estimated to be 10 MeV/sec typically, under three characteristic cases of the mirror field configuration with the heating microwave power as a parameter. Some problems associated with the stochastic cyclotron heating are discussed in the experimental light. Author

N73-17756# Centre de Recherches en Physique des Plasmas, Lausanne (Switzerland).
OBSERVATIONS OF SLOWLY VARYING MAGNETIC INDUCTION IN A ROTATING MAGNETIC FIELD PINCH
D. W. Ignat, A. Heym, F. Hofmann, and A. Lietti Nov. 1972 25 p refs
(LRP-56/72) Avail: NTIS HC $3.25

Recent measurements on a rotating magnetic field pinch reveal in the plasma core large magnetic fields which change slowly in time. Computations based on MHD theory show qualitatively that such fields should be expected, but they fail to reproduce the observed spatial extent and magnitude. Trapping and compression of the induction generated by the first half cycle of the rotating field are apparently a primary cause of the phenomenon. Author

N73-17757*# Kanner (Leo) Associates, Redwood City, Calif.
APPLICATION OF THE FLOATING-POTENTIAL PROBE FOR STUDIES OF LOW FREQUENCY OSCILLATIONS IN A PLASMA
B. Ye. Dzhakov Washington NASA Feb. 1973 20 p refs Transl. into ENGLISH from Izv. Inst. Elektron., Bulg. Akad. Nauk. (Bulgaria), v. 5, 1971 p 63-73
(Contract NASw-2481)
Avail: NTIS HC $3.00 CSCL 20I

The proper interpretation of the results obtained from measurements of the floating potential of an electrostatic probe may cause difficulties in time varying plasmas. The following limitations of the method are considered: the charge separation in the plasma, the influence of the input capacity of the measuring circuit, and the influence of the layer capacity near the probe. A detailed analysis is carried out in the cases of moving striations and ion acoustic waves. A simple measuring technique is suggested for ion acoustic studies, giving detailed information about ion density oscillations. Author

N73-17758*# Scientific Translation Service, Santa Barbara, Calif.
INVESTIGATION OF PLASMA HEATING IN A STRONG VARIABLE ELECTRIC FIELD
L. I. Grigoryeva, V. L. Sizonenko, B. I. Smerdov, K. N. Stepanov, and V. V. Chechklin Washington NASA Feb. 1973 43 p refs Transl. into ENGLISH of "Issled. Nagreva Plasmy v Silnom Peremen. Elektr. Pole", Rept. KhFTI-70-64 Phys.-Tech. Inst., Acad. Sci. Ukr. SSR, Kharkov, 1970 41 p
(Contract NASw-2483)
(NASA-TT-F-14673; KhFTI-70-64) Avail: NTIS HC $4.25 CSCL 20I

Scattering of charged particles by turbulent pulsation of an electric field which leads to effective heating of plasma was investigated. The experiments showed that, during turbulent heating of plasma by fast magneto-acoustic waves, preferential heating of ions was correlated with small amplitudes, while at large amplitudes both electrons and ions were heated. The plasma

was created by 18-microsecond pulse discharges with oscillating electrons in hydrogen. Measurement of the longitudinal energies of electrons and ions emerging from the plasma along a fixed magnetic field was accomplished with the aid of a three-network analyzer with retarding potential. Observations were also made on the instability of plasma with a transverse current, heating of electrons in the field of a turbulent plasma, and ion heating.
Author

N73-17759# Pennsylvania State Univ., University Park. Ionosphere Research Lab.
WAVE PROPAGATION AND AMPLIFICATION PROPERTIES OF THE MOLECULAR ELECTRONIC PLASMA
O. E. H. Rydbeck and A. Hjalmarson 14 Nov. 1972 48 p refs
(Grant NSF GA-33446X)
(PSU-IRL-SCI-403) Avail: NTIS HC $4.50

Wave propagation and amplification properties of the passive, or active doped, magneto-ionic medium are discussed. Such a medium, doped with molecules or atoms, is called a molecular plasma. Propagation and energy transfer effects appear when the molecular (or atomic) resonances are close to the wave (signal) frequencies or the various resonances of the magneto-ionic medium. The molecular gas may be absorptive, or emissive. New types of waves can propagate in the drifting, molecular gas. They are called molecular cyclotron waves because of their close resemblance to electron cyclotron waves. Several new wave coupling regions appear, some of which have interesting polarization selective, amplification possibilities. The nature of these wave couplings is demonstrated by dispersion curves, and is also discussed by means of energy flow and energy density relations.
Author

N73-17760# Commissariat a l'Energie Atomique, Fontenay-aux-Roses (France). Centre d'Etudes Nucleaires.
REPORT OF THE EURATOM CONTROLLED FUSION ADVISORY GROUP ON OPEN ADIABATIC CONFIGURATIONS AND RADIO FREQUENCY PLUGGING
Dec. 1971 119 p refs
(EUR-CEA-FC-628-AG) Avail: AEC Depository Libraries

The current state of research in western Europe on mirror devices (only open-type adiabatic device being considered) is presented. The scientific basis to the widespread pessimistic outlook in this field of research is discussed, together with the conclusions that can be drawn. The problems discussed include: magnetohydrodynamic stability and magnetic wells; recycling and dynamic stabilization; losses due to collisions, microinstabilities and radiation; multiple mirrors; hybrid collisionless systems, adiabatic and nonadiabatic radio II frequency plugging; external and internal re-injection schemes. Problems concerning the fuel cycle and reactor systems not based on the DT reaction are also presented.
NSA

N73-17761# Commissariat a l'Energie Atomique, Villeneuve-Saint-Georges (France).
GENERAL CHARACTERISTICS OF HEAVY ION PLASMA CREATED BY LASER
G. Tonon 1972 28 p refs In FRENCH Presented at Conf. on the Sources of Multicharged Ions, Paris
(CEA-CONF-2022) Avail: AEC Depository Libraries

A synthesis of the principal results obtained during the interaction of laser radiation with matter, and particularly the results concerning the charge state, the energy, and energy distribution of ions emitted by the plasma, is presented. From these results the utilization of these plasmas as a source of heavy multicharged ions is envisaged and the characteristics of the desirable laser are defined in this case.
Author (NSA)

N73-17762# Paris Univ., Orsay (France).
INVERSE FARADAY EFFECT IN A PLASMA Ph.D. Thesis
Martine Lagoutte [1972] 51 p refs In FRENCH
(FRNC-TH-217) Avail: AEC Depository Libraries

The existence of an inverse Faraday effect in a plasma was demonstrated. The linear variation of the magnetic field produced, with the square of the electric field component of the exciting wave, was verified. The plasma was formed by transforming a 3000 MHz electromagnetic signal having a power of a few megawatts and a duration of 12 microsec into a circularly polarized wave, electrons having the closed trajectories at the origin of the magnetic field being produced. The existence of this field was confirmed from measurements made of the flux variations induced in a coil wound around the plasma. The results are described in terms of a simple theory neglecting internal polarization effects in the plasma. It was, however, only possible to perform a complete calculation for simple geometrical configurations as the metallic elements of the set up used modified the flux variations across the coil.
NSA

N73-17763# Paris Univ., Orsay (France).
PRODUCTION AND DETECTION OF RADIATION IN THE HOLWECK ENERGY BAND: APPLICATIONS TO PLASMA-LASER SPECTROSCOPY AND PHOTOIONIZATION OF Bi Ph.D. Thesis
Pierre Dhez 1971 134 p refs In FRENCH
(FRNC-TH-216) Avail: AEC Depository Libraries

Improvements were made in experimental techniques applicable in the Holweck energy band (1000 to a few dozen A). A laser-produced plasma was used as a radiation source. A detector was developed suitable for accurately measuring the flux emitted by fast pulsed sources. The separation of the different orders of interference was studied using a double-grating spectrograph to examine the spectral continuum. New emission properties exhibited by the plasma, which result from the focusing of the laser beam by the plasma, were established. In this way, accurate results on the photoionization of Bi in an extended wavelength band were obtained. This photoionization cross section was measured between 250 and 40 eV using a double-grating spectrograph.
NSA

N73-17764# Max-Planck-Institut fuer Plasmaphysik, Garching (West Germany).
LOWER HYBRID RESONANCE HEATING OF A PLASMA IN A PARALLEL PLATE WAVEGUIDE
S. Puri and M. Tutter Jun. 1972 37 p refs
(IPP-IV-37) Avail: AEC Depository Libraries

Wave propagation in a parallel-plate metallic waveguide partially filled with an inhomogeneous, anisotropic plasma column is studied as an eigenvalue problem using the complete cold-plasma dielectric tensor. Although the accessibility condition is not met, the collisional energy absorption at the lower-hybrid resonance greatly exceeds the resistive loss at the waveguide walls resulting in a very high plasma heating efficiency. The bulk of the wave energy dissipated goes into heating the electrons. The heating continues to be effective even for very low collision frequencies encountered in thermonuclear plasmas. Detailed numerical results for the heating efficiency, energy flux into the plasma, energy density, and dissipation density in the plasma column as well as group velocity are presented. Also, the effects of density profile, collision frequency, and waveguide eigenmodes are discussed.
Author (NSA)

N73-17765# Nagoya Univ. (Japan). Inst. of Plasma Physics.
OBSERVATION OF STABLE, HIGH-MACH-NUMBER COLLISIONLESS ELECTROSTATIC SHOCKS
T. Honzawa Feb. 1972 18 p refs
(IPPJ-119) Avail: AEC Depository Libraries

Observation of large amplitude ion acoustic shocks with a high Mach number M greater than 1.6 in a collisionless plasma characterized by T sub e/T sub i congruent to 10 is described. Although they have large fluctuations behind the front, these shocks are close to the laminar rather than the turbulent ones, and they behave nonstationarily during propagation. Discussions about the nature and behavior of the shock are also given.
Author (NSA)

N73-17766# Japan Atomic Energy Research Inst., Tokai.
STUDIES ON A ROTATION IN THE POLARIZATION OF AN ELECTROMAGNETIC WAVE PROPAGATING IN A MAGNETIZED PLASMA
Akimasa Funahashi and Teruhiko Tazima Nov. 1971 19 p refs In JAPANESE; ENGLISH summary
(JAERI-M-4640) Avail: AEC Depository Libraries

Polarization of the electromagnetic waves that propagate in a magnetized plasma obliquely to the magnetic field is studied. A general expression is derived for a rotation in the wave polarization when the longitudinal component of wave field (in

the direction of wave propagation) is much less than the transverse component. Equations of the rotation are then obtained in the regions where no studies so far have been made. In addition, the 2-mm waves in JFT-2, a tokamak-type apparatus, are also examined preliminarily to obtain information on the current distributions. Author (NSA)

N73-17767# Joint Publications Research Service, Washington, D.C.

PROBE METHOD FOR RECORDING IONS PRODUCED BY LASER RADIATION IN AFTERGLOW DISCHARGE PLASMA

I. Bakov, I. Kantor, and A. Kim Oct. 1972 8 p refs Transl. into ENGLISH from Russian report NP-18765 Prepared for AEC, Washington

(AEC-TR-7324; NP-18765) Avail: NTIS

A probe method was developed for recording ions produced by laser emission, permitting highly accurate compensation of the ion background in the discharge and recording probing current change of the order of 10 to the minus 9th power amp in a time of the order 0.000001 sec. Author (NSA)

N73-17768# Joint Publications Research Service, Washington, D.C.

STUDY OF ABSORPTION OF SHF WAVES BY PLASMA AT UPPER HYBRID FREQUENCIES

A. I. Anisimov, N. I. Vinogradov, V. E. Golant, and L. P. Pakhomov Oct. 1972 9 p refs Transl. into ENGLISH from Russian report NP-18807 Prepared for AEC, Washington

(AER-TR-7321; NP-18807) Avail: NTIS

Studies on spatial distribution of concentration of charged particles in a toroidal magnetic field yielded information on the drift rate and on the absorption of superhigh frequency waves by the plasma. It was shown that the absorption of superhigh frequency waves by the plasma was localized in a comparatively narrow region of 1.5 to 2.0 cm. The localization region of the absorption of superhigh frequency energy coincided with the region of propagation of plasma waves forming as the result of linear transformation of an electromagnetic wave introduced from outside, and the attenuation length was close to the calculated length of absorption of these waves. Author (NSA)

N73-17769# California Univ., Livermore. Lawrence Livermore Lab.

CONFINEMENT STUDIES IN 2XII

F. H. Coensgen, W. F. Cummins, A. W. Molvik, W. E. Nexsen, and T. C. Simonen 18 Aug. 1972 13 p refs Presented at 5th European Conf. on Controlled Fusion and Plasma Phys., Grenoble, 21 Aug. 1972 Sponsored by AEC

(UCRL-74087; Conf-720804-8) Avail: NTIS

The containment of deuterium plasmas in a magnetic mirror well was investigated for mean plasma ion energies in the range from 1 to 10 keV. Evidence indicates that detectable plasma turbulence in this experiment arises primarily from instabilities driven by the presence of two or more maxima in the ion velocity function. The ion velocity functions of all quiescent plasmas have a single maximum. For these plasmas, neither the magnitude nor the density dependence of the loss rate was noticeably different for runs that were theoretically stable for the Dory-Guest-Harris mode and those that were unstable. Although losses induced by other instabilities (e.g., drift-cyclotron, loss-cone mode) cannot be ruled out, the high density data from quiescent decays appear to be in agreement with the Baldwin-Callen theory of collective scattering. Author (NSA)

N73-17770*# North Carolina State Univ., Raleigh. Dept. of Physics.

EQUIPMENT LOAN CONTRACT Final Report, 1 Oct. 1966 - 30 Sep. 1971

Willard H. Bennett 19 Jan. 1972 8 p refs Sponsored in part by NASA and NSF

(Contract N00014-67-C-0170; NR Proj. 012-307)

(NASA-CR-130533; AD-746884) Avail: NTIS HC $3.00 CSCL 20/9

The paper consists of: (1) the investigation of the electric pinch; (2) development of methods for producing a cylindrically symmetric plasma completely free of spurious oscillations and instabilities; (3) use of such a plasma for investigations of various kinds of plasma waves; and (4) studies of the beam-plasma interaction of a thin electron stream injected along the axis of such a cylindrically symmetric plasma. Author (GRA)

N73-17771# Army Electronics Command, Fort Monmouth, N.J.

LASER ACTION FROM A DYNAMICALLY COMPRESSED XENON PLASMA Research and Development Technical Report

A. Papayoanou, R. G. Buser, and I. Gumeiner Jun. 1972 45 p refs

(DA Proj. 1S6-62705-A-056)

(AD-752085; ECOM-3592) Avail: NTIS CSCL 20/5

Laser action has been found to occur during the interval of time when a xenon plasma is contracting (pinching) due to self-electromagnetic forces. Laser lines have been found between the ultraviolet and orange portion of the spectrum, all belonging to triply ionized ionic species. Peak powers exceeding 500 watts have been detected on several of these lines. Their time of occurrence, wavelength, duration, power and coherence length have been measured. Optimum pressures and currents have been found and compared with other published results. In addition, using a simplified model of a pinching plasma column, streak camera pictures of the contracting column, and interferometric measurements of the time varying electron density, one can estimate electron temperatures. Values of the electron temperature and density as well as the conductivity are compared with other published results. Author (GRA)

N73-17772# Applied Physics Lab., Johns Hopkins Univ., Silver Spring, Md.

EQUILIBRIUM STATE OF FINITE LENGTH PLASMA PUFFS: A GREEN'S FUNCTION APPROACH TO THE RESULTANT GENERALIZED AXISYMMETRIC POTENTIAL EQUATION

Howard M. Stainer Aug. 1972 28 p refs

(Contract N00017-72-C-4401)

(AD-752498; APL-TG-1200) Avail: NTIS CSCL 20/9

The equilibrium state of plasma puffs produced by a theta-pinch gun firing into an axial magnetic field has been studied theoretically. The plasma puffs are of finite length, with radially and axially dependent density gradients. This model, which is physically more realistic than an infinitely long puff, leads to a nonlinear partial differential equation for the density that is related to the generalized antisymetric potential (GASP) type of equation. A Green's function method is described for converting the partial differential density equation into an iterative integral equation that appears more amenable to computer treatment. The iterated density thus becomes a functional of the trial density, which is the kernel of the integral equation. Author (GRA)

N73-17773# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

THE HYDRODYNAMICS AND KINETICS OF MULTIPLY-IONIZED CONFINED WEAKLY-ABSORBING LASER PLASMA

Yu. A. Afanasev, E. M. Belenov, O. N. Krokhin, and I. A. Poluektov 19 Oct. 1972 10 p refs Transl. into ENGLISH from Akad. Nauk SSSR, Fiz. Inst., Kratkiye Soobshch. po Fiz. (Moscow), no. 5, 1970 p 43-47

(AD-751880; FTD-HT-23-1502-72) Avail: NTIS CSCL 20/9

The kinetics of multiple ionization of matter in a field of powerful laser radiation, without consideration of hydrodynamic motion, had been examined in a previous paper. In this paper the results of the previous paper are generalized to the case when hydrodynamic motion of the plasma can play an essential role, i.e., in essence, consideration of hydrodynamics reduces the restriction on the pulse duration. GRA

N73-17774# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.

ELECTRODELESS DISCHARGE IN XENON AT PRESSURES TO 40 ATMOSPHERES

K. K. Pryadkin, R. V. Mitin, and N. N. Klimov 27 Oct. 1972 13 p refs Transl. into ENGLISH from Zh. Prik. Spektroskoppi, Akad. Nauk Belorussk. SSR (Minsk), v. 10, no. 5, 1969 p 721-724

(AF Proj. G101)

(AD-751944; FTD-HT-23-839-72) Avail: NTIS CSCL 20/9

The report discusses the possible stable occurrence of electrodeless high-frequency discharges in xenon at pressures

ranging up to 40 atmospheres. Two structurally different discharge chambers were used. The aim of the tests was to determine the character of the dependence of the fraction of radiant losses in the total energy balance of the discharge on the full discharge power and pressure. Graphs are presented in illustration of these relations and the resultant findings are discussed. Author (GRA)

N73-17775# Aerospace Corp., El Segundo, Calif. Lab. Operations.
SIMPLE X-RAY BANDPASS FILTERS FOR NANOSECOND RESOLUTION OF PLASMA SPECTRA Report for Mar. 1970 - Feb. 1972
Melvin J. Bernstein 30 Oct. 1972 25 p refs
(Contract F04701-72-C-0073)
(AD-752544; TR-0073(3220-60)-1; SAMSO-TR-72-264) CSCL 20/9

A novel type of bandpass filter for X rays has been developed for use in studies of hot transient plasmas. Suitable bandpass intervals are defined by transmission through thin K-edge filters and absorption in matched thicknesses of scintillator material. The scintillator light signals are detected by either a set of photomultipliers or an image-converter camera, operated in the streak mode. Filters of Mg, Al, Cl, and Ti cover the 1- to 5-keV photon energy range and are useful with plasmas that have temperatures of 0.2 to 2.0 keV. Author (GRA)

N73-17776# Minnesota Univ., Minneapolis. Dept. of Electrical Engineering.
STUDY OF PROPERTIES OF PLASMAS PRODUCED IN MOLECULAR GASES BY MEANS OF MASS AND OPTICAL SPECTROSCOPY Final Report, 31 Aug. 1971 - 31 Aug. 1972
Hendrick J. Oskam Sep. 1972 16 p refs
(Contract F19628-72-C-0042; AF Proj. 4642)
(AD-751938; AFCRL-72-0573) Avail: NTIS CSCL 20/9

Results obtained from studying plasmas by means of mass and optical spectroscopy are summarized. The measuring method consisted of measuring the time dependence of the density of ions and that of the intensity of spectral lines and bands emitted during the plasma decay period. The plasmas were produced in neon, nitrogen, and in helium-nitrogen, neon-nitrogen and helium-hydrogen mixtures. Production and loss mechanisms of ions were established, while the origin of the emission of light during the plasma decay period was determined. Author (GRA)

26 PHYSICS, SOLID-STATE

Includes semiconductor theory; and superconductivity. For applications see: 16 Masers. For related information see also: 10 Electronics.

N73-17777*# Solitron Devices, Inc., Riviera Beach, Fla. Transistor Div.
DEVELOPMENT OF HIGH TEMPERATURE, HIGH RADIATION RESISTANT SILICON SEMICONDUCTORS Contract Final Report
Charles A. Whorl and A. W. Evans [1972] 65 p
(Contract NAS8-25917)
(NASA-CR-124074; DCN-LO-40-02692) Avail: NTIS HC $5.25 CSCL 20L

The development of a hardened silicon power transistor for operation in severe nuclear radiation environments at high temperature was studied. Device hardness and diffusion techniques are discussed along with the geometries of hardened power transistor chips. Engineering drawings of 100 amp and 5 amp silicon devices are included. F.O.S.

N73-17778*# Alabama Univ., Huntsville.
INVESTIGATION OF CRYSTAL GROWTH IN ZERO GRAVITY ENVIRONMENT AND INVESTIGATION OF METALLIC WHISKERS
J. H. Davis, R. B. Lal, H. U. Walter, and J. G. Castle, Jr. Dec. 1972 255 p refs
(Contracts NAS8-24612; NAS8-26793)
(NASA-CR-124065) Avail: NTIS HC $14.75 CSCL 20B

Theoretical and experimental work reported relates to the effects of near-zero gravity on growths of crystals and metallic whiskers during Skylab and Apollo flight experiments. Studies on growth and characterization of candidate materials for flight experiments cover indium-bismuth compounds, bismuth single crystals, gallium arsenide films and single crystals, and cadmium whiskers. G.G.

N73-17779*# Texas Univ., Austin. Dept. of Electrical Engineering.
LOW TEMPERATURE RECOMBINATION AND TRAPPING ANALYSIS IN HIGH PURITY GALLIUM ARSENIDE BY MICROWAVE PHOTODIELECTRIC TECHNIQUES Final Report
Moiz B. Khambaty and William H. Hartwig 30 Sep. 1972 142 p refs
(Grant NGL-44-012-043)
(NASA-CR-130764) Avail: NTIS HC $9.25 CSCL 20L

Some physical theories pertinent to the measurement properties of gallium arsenide are presented and experimental data are analyzed. A model for explaining recombination and trapping high purity gallium arsenide, valid below 77 K is assembled from points made at various places and an appraisal is given of photodielectric techniques for material property studies. Author

N73-17780*# Texas Univ., Austin. Dept. of Electrical Engineering.
TiO2 FILM PROPERTIES AS A FUNCTION OF PROCESSING TEMPERATURE, VOLUME 3 Final Report
Eugene T. Fitzgibbons, K. J. Sladek, and W. H. Hartwig 30 Sep. 1972 7 p refs Repr. from J. Electrochem. Soc., v. 119, no. 6, Jun. 1972
(Grant NGL-44-012-043)
(NASA-CR-130763) Avail: NTIS HC $3.00 CSCL 20L

Thin film TiO2 was produced at 150 C by chemical vapor deposition using hydrolysis of tetraisopropyl titanate. Films were amorphous as grown, but annealing in air caused crystallization, with anatase formed beginning at 350 C and rutile at 700 C. Density and index of refraction increased substantially with increasing anneal temperature, while etch susceptibility in HF and H2SO4 decreased. Comparison with literature data showed two groups of processes. One group yields films having properties that gradually approach those of rutile with increasing process temperature. The other group gives rutile directly at moderate temperatures. Deposition of amorphous film followed by etching and annealing is suggested as a means for pattern definition. Author

N73-17781*# College of William and Mary, Williamsburg, Va.
PRECISE MEASUREMENT OF CHARGED DEFECTS IN III-V COMPOUNDS (2) Final Report
J. F. Soest 28 Apr. 1972 23 p refs
(Grant NGR-47-006-050)
(NASA-CR-112224) Avail: NTIS HC $3.25 CSCL 20L

The main objective of this research is to obtain a calibration of a low concentration of charged defects in some III-V semiconducting compounds. The experimental technique being used is nuclear magnetic resonance (NMR), and the objective is to be attained through a thorough examination of the properties of the NMR lines of the nuclei in the III-V compounds. The properties of the NMR lines, and how they are influenced by the presence of charged defects are studied theoretically and experimentally. Author

N73-17782# Technischen Universitaet, Munich (West Germany).
MICROSCOPIC THEORY OF LATTICE DYNAMICS AND APPLICATION TO TRANSITION METALS Ph.D. Thesis [MIKROSKOPISCHE THEORIE DER GITTERDYNAMIK UND IHRE ANWENDUNG AUF UEBERGANGSMETALLE]
Werner Hanke 1972 67 p refs In GERMAN
Avail: NTIS HC $5.50

Quantum mechanical equations are formulated and used to study lattice dynamics in ideal crystal. Random approximation for the electronic response produces factorization of the electronic susceptibility and inversion of the infinite dimensional dielectric crystal matrix. Transformation of the dynamic matrix for interacting electrons and nuclei to an inverse dielectric matrix results in microscopic dipole model for lattice dynamics that is applicable

to normal metals as well as transition metals, semiconductors, and ionic crystals. Transl. by G.G.

N73-17783# Technischen Universitaet, Munich (West Germany).
LATTICE DYNAMICS OF HARD MATERIALS AND TRANSITION METALS Ph.D. Thesis [ZUR GITTERDYNAMIK DER HARTSTOFFE UND UEBERGANGSMETALLE]
Werner Weber 1972 75 p refs In GERMAN
Avail: NTIS HC $5.75

A shell model is formulated and used to analyze phonon dispersion anomalies in group 4 to group 6 elements and some transition metals; shielding of longitudinal optical branches for long waves is considered. Analogies in transition metal phonon spectra and analyses of phase dependencies show that certain types of oscillations produce lattice instabilities and lead to soft mode behavior. The model is also used to describe anomalies in phonon dispersion curves of the molybdenum niobium system. The connection between lattice instability and increased superconductivity temperature is studied by acoustic plasmon and electron-phonon coupling hypotheses. Transl. by G.G.

N73-17784*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
OPTICAL TRANSMISSION MEASUREMENTS ON MONOCRYSTALLINE AND POLYCRYSTALLINE CESIUM IODIDE
Walter Viehmann, John F. Arens, and Manfred Simon (Max Planck Inst. fuer Extraterrestrische Phys.) Jan. 1973 27 p Submitted for publication
(NASA-TM-X-66178; X-764-73-1) Avail: NTIS HC $3.50 CSCL 20L

A summary is presented of optical measurements performed on a variety of cesium iodide samples to characterize quantitatively the optical quality of the materials, and to define and measure parameters which determine its suitability as a detector material for high energy cosmic ray experiments on HEAO-A. The general case of light transmission through a long rectangular slab under multiple internal reflections is discussed along with transmission and scattering as a function of wavelength at normal incidence. Scattering parameters are tabulated for encapsulated single crystal CsI and polyscin. F.O.S.

N73-17785# Laboratoire Central de Recherches Thomson-CSF, Orsay (France).
EXPERIMENTAL STUDY OF A GALLIUM ARSENIDE FIELD EFFECT TRANSISTOR Final Report [ETUDE EXPERIMENTALE DES TRANSISTORS A EFFET DEC CHAMP EN ARSENIURE DE GALLIUM RAPPORT DE SYNTHESE FINALE]
O. Cahen, A. Bobenrieth, and Tung Pham Ngu [1971] 32 p refs In FRENCH
(Contract DRME-70/34-047-00-480-75-01)
(Doc-Ref-3-314) Avail: NTIS HC $3.75

Field effect transistors have been manufactured using Ge As semiconducting substrates, type n epitaxy, Ag Ge junctions, 6 mu thickness and 400 to 800 micron length Al Schottky barrier. Performance characteristics of these transistors have been evaluated, including equivalent circuits, Y parameter calculation, power gain, limit frequency, and noise factor. It is concluded that these transistors with a 8.5 db gain and 3.6 db at 1 GHz could be used as low noise amplifiers for the same frequency level. In addition frequency limits of Si and Ge As field effect transistors have been compared. Author

N73-17786# Aerospace Corp., El Segundo, Calif. Lab. Operations.
HIGH FREQUENCY RESPONSE OF JOSEPHSON POINT CONTACTS Report for Jun. 1970 - Jun. 1972
H. Kanter and F. L. Vernon, Jr. 1 Oct. 1972 52 p refs
(Contract F04701-72-C-0073)
(AD-751911; TR-0073(9230-20)-2; SAMSO-TR-72-243) Avail: NTIS CSCL 20/12

For a current driven Josephson junction shunted by an ohmic resistance, the dc voltage response and impedance to external high frequency currents are calculated with a second order perturbation method based on the unperturbed solution for the time evolution of the voltage as given by Aslamazov and Larkin. The response is proportional to signal power and has three characteristic frequency regions depending on whether the internal, self-generated Josephson frequency is larger than, equal to, or smaller than the signal frequency. Author (GRA)

N73-17787# Naval Ordnance Lab., White Oak, Md.
EFFECTS OF ANNEALING IN THE ELECTRO-OPTICAL PROPERTIES OF AMORPHOUS Ge(.5)Te(.5) FILMS
K. P. Scharnhorst and H. R. Riedl 15 Aug. 1972 46 p refs
(ZR00-001-010)
(AD-752024; NOLTR-72-196) Avail: NTIS CSCL 20/12

The temperature and intensity dependences of photoconductivity, Delta sigma, at lambda = 1.10 micrometers and the room temperature spectral response in annealed films (annealing temperature 100C) of amorphous Ge.5Te.5 were studied and interpreted in terms of recombination models. Author (GRA)

N73-17788# Aerospace Corp., El Segundo, Calif. Lab. Operations.
RESPONSE OF THE SELF-DRIVEN, WEAKLY CONNECTED SUPERCONDUCTING RING (AC SQUID) Report for Sep. 1971 - Feb. 1972
Helmut Kanter and Arnold H. Silver 15 Nov. 1972 25 p refs
(Contract F04701-72-C-0073)
(AD-752213; TR-0072(9230-20)-4; SAMSO-TR-72-257) Avail: NTIS CSCL 14/2

The response of a resonance circuit when coupled to a superconducting ring incorporating a small voltage-biased Josephson junction is investigated. Author (GRA)

N73-17789# Weizmann Inst. of Science, Rehovoth (Israel). Dept. of Electronics.
RARE EARTH ORTHOFERRITES: MICROMAGNETIC INTERACTIONS Final Technical Report, 1 Jun. 1971 - 31 May 1972
Shmuel Shtrikman and David Treves 31 Jul. 1972 12 p refs
(Contract F44620-71-C-0099; Grant AF-AFOSR-2327-72)
(AD-751995; AFML-TR-72-251) Avail: NTIS CSCL 20/12

The final scientific report covers all scientific work performed under the contract during the period of June 1, 1971 to May 31, 1972. Rare earth perovskites and Mossbauer spectroscopy are discussed. GRA

N73-17790# Radio Corp. of America, Princeton, N.J.
CONDUCTION MECHANISMS FOR ELECTRONIC DEVICES
David Redfield Nov. 1972 19 p
(Contract N00014-71-C-0371)
(AD-752100; PRRL-72-CR-28) Avail: NTIS CSCL 20/12

Previously developed techniques of preparing controlled energy band tails in heavily doped, closely compensated GaAs are being exploited to exhibit the electronic transport properties in band tails. These properties closely resemble the corresponding properties of amorphous semiconductors but the control available in the present materials has added greatly to the capabilities necessary for understanding the nuclear behavior in amorphous semiconductors. A systematic program of relating several different properties has been started to increase the value of the separate measurements (e.g., temperature and electric field dependence of the dc conductivity, ac conductivity, and photoconductivity). One of the specific results of primary interest was the highly detailed, accurate measurement of the temperature dependence of the dc conductivity which displayed the relation Log sigma approximately equal to T to the minus 1/2 power. Theory indicates that this suggests one-dimensional conduction in the band tails since normal, three-dimensional conduction should give Log sigma approximately = T to the minus 1/4 power. The other major result showed that the low-temperature conductivity has a nearly exponential dependence on electric field strength, extending down to approximately 2 V/cm. This very low-field sensitivity is unexpected and is the basis for increased understanding of the electronic behavior in band tails. Author (GRA)

N73-17791# New Mexico Univ., Albuquerque. Bureau of Engineering Research.
A RADIATION EFFECTS RESEARCH PROGRAM Annual Report, 1 Sep. 1971 - 31 Aug. 1972
W. W. Grannemann, R. C. Allen, Jr., L. T. Boatwright, W. J.

Byatt, and G. M. Wing Sep. 1972 145 p refs
(Contract N00014-68-A-0158)
(AD-752561; EE-199(72)ONR-005) Avail: NTIS CSCL 20/12

Contents: Invariant imbedding applied to the solution of transport problems with internal sources - The ill-behaved reflection function case; Energy levels and density of states in three-dimensional crystals; Band structure of silicon by the APW method; Wave functions in semiconductors; Thermal oxidation of gallium arsenide phosphide; Radiation effects on GaAsP MIS capacitors; Open-tube Zn-diffused GaAs(1-x)P(x) light-emitting diodes; A study of GaAs(1/2)P(1/2) MIS capacitors fabricated by using electron-beam-evaporated aluminum oxide; Electron and neutron radiation effects on electron-beam evaporated high-mobility thin films of indium antimonide; Fabrication of p-type tellurium thin-film transistors using photoengraving and anodized A1203 techniques; Pulsed electron beam bombardment of semiconductor materials; Metal-insulator-semiconductor structures; Hybrid radiation-hardened line-driver amplifier; Radiation testing accessories designed for use during electron-beam tee experiments. GRA

N73-17792# Emmanuel Coll., Boston, Mass. Oriental Science Research Library.
ON THE SYNTHESIS OF SiC SINGLE CRYSTALS
Yoshizo Inomata and Hirokichi Tanaka 5 Sep. 1972 15 p refs Transl. into ENGLISH from Yogyo Kyokai-Shi (Tokyo), v. 79, no. 10, 1971 p 392-395
(Contract F19628-71-C-0121)
(AD-752227; EMM-72-280; AFCRL-72-0527; AFCRL-Trans-99) Avail: NTIS CSCL 20/2

A method is proposed to synthesize SiC single crystals free of carbon particle inclusions. An empty graphite crucible is connected with the crucible containing silicon melt by means of a graphite pipe. The former crucible is heated to approximately 2,500 C, as in the ordinary sublimation process, while the temperature of the latter is lowered. Crystal growth is accomplished in the empty crucible. The experiments conducted are preliminary. Problems such as damages to the crucible containing silicon melt, prevention of silicon leak, and control of the amount of silicon supply to the growth cavity are examined. The structure of the furnace necessary for the implementation of the method is discussed. Author (GRA)

N73-17793# Litton Systems, Inc., Morris Plains, N.J. Airtron Div.
RESEARCH ON ZIRCON POLARIZERS Quarterly Report, Jul. - Sep. 1972
Robert Uhrin, Roger F. Belt, and Richard C. Puttbach 31 Oct. 1972 29 p refs
(Contract N00014-70-C-0379; NR Proj. 016-403)
(AD-752147; R11-590-9; QR-9) Avail: NTIS CSCL 20/2

Experiments on the growth of single crystal zircon (ZrSiO4) were continued with the hydrothermal method. High quality growth at 0.003 inch per day continued to be obtained in 1.0 inch internal diameter autoclaves when used near 600 C with a mixed mineralizer of 4m KF-1m LiF. At temperatures near 700 C growth rates on (100) seeds approached 0.010 inch per day in 1.5 inch internal diameter autoclaves, but the growth quality was poor. Wadeite (K2ZrSi3O9) nucleation has been reduced substantially by changing to a 2m KF-1m LiF solution at the higher temperatures. Since good quality growth has been obtained near the end of some experiments, it is felt that high quality growth can be achieved by eliminating wadeite and maintaining a lower thermal gradient between the nutrient and seed. Author (GRA)

N73-17794# Rochester Univ., N.Y.
EXPERIMENTAL STUDIES OF SUPERCONDUCTIVITY Final Report, 1 Aug. 1963 - 31 Jul. 1969
R. D. Parks 1972 7 p
(Grants DA-ARO(D)-31-124-G489; DA-ARO(D)-31-124-G844)
(AD-751869; AROD-4374-24-p) Avail: NTIS CSCL 20/3

Abstracts of 19 publications generated by this project during the period 1963 - 1969 are presented. Author (GRA)

N73-17795# Texas A&M Univ., College Station. Dept. of Mechanical Engineering.
A PHENOMENOLOGICAL CRITERION FOR UNIAXIAL YIELD OF DUCTILE MATERIALS Final Report
Howard S. Wolko and Ping Y. Tsai Sep. 1972 44 p refs
(Grant AF-AFOSR-1751-69; AF Proj. 9782)
(AD-752573; AFOSR-72-2229TR) Avail: NTIS CSCL 20/12

A phenomenological criterion for uniaxial yield of ductile materials is presented. The criterion is based on the occurrence of a detectable extremum in the deformation induced temperature-time curve. Experimental evidence obtained from test of mild (1020) steel substantiates the validity of the criterion and provides information on the manner in which Poisson's ratio changes from its elastic value to its incompressible value during elastic-plastic transition. Author (GRA)

N73-17796# Rochester Univ., N.Y.
EXPERIMENTAL STUDIES OF SUPERCONDUCTIVITY Final Report, 1 Aug. 1969 - 31 Jul. 1972
R. D. Parks 1972 7 p
(Grant DA-ARO(D)-31-124-G9; DA Proj. 200-61102-B-11B)
(AD-751855; AROD-4374-25-P) Avail: NTIS CSCL 20/12

Research accomplished in the experimental study of superconductivity during the period 1969 - 1972 is summarized via abstracts of ten publications. Author (GRA)

N73-17797# Pennsylvania State Univ., University Park. Materials Research Lab.
CONTACTS BETWEEN CHALCOGENIDE GLASSES, METALS AND SEMICONDUCTORS Semiannual Technical Report
S. H. Lee and H. K. Henisch 1 Dec. 1972 24 p refs
(Contract DAHC04-70-C-0047; ARPA Order 1562)
(AD-752560) Avail: NTIS CSCL 20/12

The purposes of the research are to elucidate the mechanism of threshold switching, and to explore systems with contact materials which can be electronically altered in situ. With this end in view, the experimental work performed during the last six months has concerned itself with the following problems: Calculation of the voltage-current characteristics in the ON-state, based on a free-carrier space charge model; Establishment of a criterion for the instability (threshold) point, based on the equivalence of dielectric relaxation time and carrier lifetime; and, Attempts at correlating carrier lifetime with the short-term memory and minimum holding current of threshold switches. GRA

N73-17798# Lincoln Lab., Mass. Inst. of Tech., Lexington.
SOLID STATE RESEARCH 1972, 3 Quarterly Technical Summary, 1 May - 31 Jul. 1972
Alan L. McWhorter 13 Nov. 1972 88 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-752556; ESD-TR-72-211) Avail: NTIS CSCL 20/12

The report covers in detail the solid state research work of the Solid State Division at Lincoln Laboratory for the period 1 May through 31 July 1972. The topics covered are Solid State Device Research, Quantum Electronics, Materials Research, Physics of Solids and Microelectronics. Author (GRA)

N73-17799# Stanford Research Inst., Menlo Park, Calif.
DEVICE APPLICATION OF HIGH TEMPERATURE SUPERCONDUCTORS Final Report, 1 Mar. 1969 - 31 Oct. 1971
Martin Nisenoff 31 Oct. 1972 49 p refs
(Contract N00014-69-C-0183; SRI Proj. 7806)
(AD-752593) Avail: NTIS CSCL 20/3

Superconducting cylindrical films of niobium with superconducting transition temperatures Tc of about 9K and of niobium nitride with Tc of about 10K were prepared by dc sputtering procedures. A sputter etch technique was developed to sculpture into these films narrow constrictions (0.5 micrometer wide or less) that exhibit good edge definition and are reproducible from film to film. Although the rf impedance of these sculptured films does not vary periodically with applied magnetic flux, it appears that successful operation of these devices might be observed if the thicknesses of these films are reduced. Recommendations for future developmental work on preparing dependable and reliable weak link devices from Nb and NbN films are given, along with suggestions for research programs directed toward demonstrating the feasibility of using these devices in Naval operational systems. Author (GRA)

27 PROPELLANTS

Includes fuels; igniters; and oxidizers. For basic research see: 06 Chemistry; and 33 Thermodynamics and Combustion. For related information see also: 28 Propulsion Systems.

N73-17800*# Boeing Co., Seattle, Wash.
ADVANCED TECHNIQUES FOR DETERMINING LONG TERM COMPATIBILITY OF MATERIALS WITH PROPELLANTS Interim Report
Richard L. Green Jun. 1972 118 p refs
(Contract NAS7-789)
(NASA-CR-130546; D180-14839-1) Avail: NTIS HC $8.00 CSCL 21I

The search for advanced measurement techniques for determining long term compatibility of materials with propellants was conducted in several parts. A comprehensive survey of the existing measurement and testing technology for determining material-propellant interactions was performed. Selections were made from those existing techniques which were determined could meet or be made to meet the requirements. Areas of refinement or changes were recommended for improvement of others. Investigations were also performed to determine the feasibility and advantages of developing and using new techniques to achieve significant improvements over existing ones. The most interesting demonstration was that of the new technique, the volatile metal chelate analysis. Rivaling the neutron activation analysis in terms of sensitivity and specificity, the volatile metal chelate technique was fully demonstrated. Author

N73-17801*# Lockheed Missiles and Space Co., Huntsville, Ala.
STUDY OF PROPELLANT DYNAMICS IN A SHUTTLE TYPE LAUNCH VEHICLE Interim Report
C. E. Jones and G. C. Feng Apr. 1972 29 p refs
(Contract NAS8-27012)
(NASA-CR-124070; LMSC/HREC-D225823; HREC-7012-1) Avail: NTIS HC $3.50 CSCL 21I

A method and an associated digital computer program for evaluating the vibrational characteristics of large liquid-filled rigid wall tanks of general shape are presented. A solution procedure was developed in which slosh modes and frequencies are computed for systems mathematically modeled as assemblages of liquid finite elements. To retain sparsity in the assembled system mass and stiffness matrices, a compressible liquid element formulation was incorporated in the program. The approach taken in the liquid finite element formulation is compatible with triangular and quadrilateral structural finite elements so that the analysis of liquid motion can be coupled with flexible tank wall motion at some future time. The liquid element repertoire developed during the course of this study consists of a two-dimensional triangular element and a three-dimensional tetrahedral element. Author

N73-17802*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLID PROPELLANT AND METHOD OF PREPARATION Patent Application
George M. Simmons and John I. Shafer, inventors (to NASA) Filed 2 Feb. 1973 25 p
(Contract NAS7-100)
(NASA-Case-NPO-11975-1; US-Patent-Appl-SN-329243) Avail: NTIS HC $3.25 CSCL 21I

A solid propellant composition of improved efficiency, comprising an oxidizer such as ammonium perchlorate and having finely divided burnable metal, such as aluminum, uniformly distributed throughout the particles of the oxidizer and the propellant composition is prepared. The inorganic metal-oxidizer material of the propellant composite is obtained by forming a saturated water solution of the oxidizer, ammonium perchlorate, at an elevated temperature. Then the aluminum fuel is added, and while maintaining the solution under agitation, the solution is cooled and the oxidizer particles having metal fuel particles are crystallized. A suitable binder such as a polyurethane is mixed with the metal-oxidizer material and the mixture is then cured to produce a final propellant composition. NASA

N73-17803# Esso Research and Engineering Co., Linden, N.J. Government Research Lab.
FUEL MODIFICATION FOR ABATEMENT OF AIRCRAFT TURBINE ENGINE OXIDES OF NITROGEN EMISSIONS Final Report, 26 Apr. 1971 - 31 May 1972
Henry Shaw Oct. 1972 134 p refs
(Contract F33615-71-C-1575; AF Proj. 3066)
(AD-752581; GRU.1GDJA.72; AFAPL-TR-72-80) Avail: NTIS CSCL 21/4

The report describes a broad experimental program that was undertaken to assess the feasibility of reducing NO(x) from aircraft gas turbine engines by fuel modification. The Esso High Pressure Cannular Combustor was used to simulate the characteristic emissions of gas turbines at full power operation. Over 70 fuel modifications were tested using Jet A as the base fuel. Soluble compounds of cobalt, iron, magnesium, and copper reduce NO(x) by as much as 30% when added to the fuel at a treat rate of up to 0.5% (w). None of the investigated additives were fully acceptable because of the relatively low NO(x) reduction that was obtained even with high additive treat rates. A simple expression was derived which is useful in estimating NO levels in gas turbine combustors when equilibrium NO(x) concentrations and temperature are known. Author (GRA)

N73-17804# Thiokol Chemical Corp., Brigham City, Utah. Wasatch Div.
CARTON/MOTOR SAMPLE CORRELATION
S. J. Bennett 30 Oct. 1972 197 p refs
(Contract F04611-71-C-0026)
(AD-752612; AFRPL-TR-72-117; Rept-1072-39714) Avail: NTIS CSCL 21/9

A difference has been observed in the mechanical properties of propellant taken from a dissected motor after storage and carton samples which have been similarly stored. This discrepancy in data values has been attributed to an exotherm during cure which increases temperatures as much as 15F in the motor samples compared with carton samples. The objective of the program is to determine whether altering the carton sample cure temperature history can correspondingly alter the carton sample mechanical properties so as to permit a more accurate calculation of actual motor properties. The necessary equations, coefficients, and parameters have been established, and it is believed that the program objective can be accomplished. Author (GRA)

28 PROPULSION SYSTEMS

Includes air breathing, electric, liquid, solid, and magnetohydrodynamic propulsion. For nuclear propulsion see: 22 Nuclear Engineering. For basic research see: 23 Physics, General; and 33 Thermodynamics and Combustion. For applications see: 31 Space Vehicles. For related information see also: 27 Propellants.

N73-17805*# Kollsman Instrument Corp., Syosset, N.Y.
SYSTEM FOR MEASURING TURBINE BLADE TEMPERATURES Final Report, 12 Jun. - 12 Dec. 1972
J. Micali 11 Dec. 1972 14 p ref
(Contract NAS8-28952)
(NASA-CR-124056) Avail: NTIS HC $3.00 CSCL 21E

The results and methods of tests performed in verifying the basic preperational capabilities of the system for measuring the turbine blade temperature are reported. Author

N73-17806*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Guidance and Control Div.
RESULTS OF SOLAR ELECTRIC THRUST VECTOR CONTROL SYSTEM DESIGN, DEVELOPMENT AND TESTS
G. E. Fleischer 15 Feb. 1973 59 p refs
(Contract NAS7-100)
(NASA-CR-130622; JPL-TR-32-1578) Avail: NTIS HC $5.00 CSCL 21C

Efforts to develop and test a thrust vector control system TVCS for a solar-energy-powered ion engine array are described. The results of solar electric propulsion system technology (SEPST) III real-time tests of present versions of TVCS hardware in combination with computer-simulated attitude dynamics of a

solar electric multi-mission spacecraft (SEMMS) Phase A-type spacecraft configuration are summarized. Work on an improved solar electric TVCS, based on the use of a state estimator, is described. SEPST III tests of TVCS hardware have generally proved successful and dynamic response of the system is close to predictions. It appears that, if TVCS electronic hardware can be effectively replaced by control computer software, a significant advantage in control capability and flexibility can be gained in future developmental testing, with practical implications for flight systems as well. Finally, it is concluded from computer simulations that TVCS stabilization using rate estimation promises a substantial performance improvement over the present design. Author

N73-17807*# Georgia Inst. of Tech., Atlanta.
THE PREDICTION OF THREE-DIMENSIONAL LIQUID-PROPELLANT ROCKET NOZZLE ADMITTANCES
W. A. Bell and B. T. Zinn Feb. 1973 62 p refs
(Grant NGL-11-002-085)
(NASA-CR-121129) Avail: NTIS HC $5.25 CSCL 21H

Crocco's three-dimensional nozzle admittance theory is extended to be applicable when the amplitudes of the combustor and nozzle oscillations increase or decrease with time. An analytical procedure and a computer program for determining nozzle admittance values from the extended theory are presented and used to compute the admittances of a family of liquid-propellant rocket nozzles. The calculated results indicate that the nozzle geometry entrance Mach number and temporal decay coefficient significantly affect the nozzle admittance values. The theoretical predictions are shown to be in good agreement with available experimental data. Author

N73-17808*# Battelle Columbus Labs., Ohio.
DEVELOPMENT OF GAS-PRESSURE BONDING PROCESS FOR AIR-COOLED TURBINE BLADES Final Report
K. E. Meiners 15 Feb. 1972 169 p
(Contract NAS3-10491)
(NASA-CR-121090) Avail: NTIS HC $10.50 CSCL 21E

An investigation was conducted on the application of gas-pressure bonding to the joining of components for convectively cooled turbine blades and vanes. A processing procedure was established for joining the fins of Udimet 700 and TD NiCr sheet metal airfoil shells to cast B1900 struts without the use of internal support tooling. Alternative methods employing support tooling were investigated. Testing procedures were developed and employed to determine shear strengths and internal burst pressures of flat and cylindrical bonded finned shell configurations at room temperature and 1750 F. Strength values were determined parallel and transverse to the cooling fin direction. The effect of thermal cycles from 1750 F to room temperature on strength was also investigated. Author

N73-17809*# AiResearch Mfg. Co., Torrance, Calif.
ANALYTICAL INVESTIGATION OF CHORD SIZE AND COOLING METHODS ON TURBINE BLADE COOLING REQUIREMENTS. BOOK 1: SECTIONS 1 THROUGH 8 AND APPENDIXES A THROUGH I
F. E. Faulkner Aug. 1971 378 p refs
(Contract NAS3-13205)
(NASA-CR-120882-Bk-1; AiResearch-71-7487-Bk-1) Avail: NTIS HC $21.00 CSCL 21E

A study was conducted to determine the effect of chord size on air cooled turbine blades. In the preliminary design phase, eight turbine blade cooling configurations in 0.75-in., 1.0-in., and 1.5-in. chord sizes were analyzed to determine the maximum turbine inlet temperature capabilities. A pin fin convection cooled configuration and a film-impingement cooled configuration were selected for a final design analysis in which the maximum turbine inlet temperature was determined as a function of the cooling air inlet temperature and the turbine inlet total pressure for each of the three chord sizes. The cooling air flow requirements were also determined for a varying cooling air inlet temperature with a constant turbine inlet temperature. It was determined that allowable turbine inlet temperature increases with increasing chord for the convection cooled and transpiration cooled designs, however, the film-convection cooled designs did not have a significant change in turbine inlet temperature with chord. Author

N73-17810*# AiResearch Mfg. Co., Torrance, Calif.
ANALYTICAL INVESTIGATION OF CHORD SIZE AND COOLING METHODS ON TURBINE BLADE COOLING REQUIREMENTS. BOOK 2: APPENDIXES J THROUGH M
F. E. Faulkner Aug. 1971 334 p refs
(Contract NAS3-13205)
(NASA-CR-120882; AiResearch-71-7487-Bk-2) Avail: NTIS HC $18.75 CSCL 21E

For abstract see N73-17809

N73-17811*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLAR ELECTRIC PROPULSION SYSTEM INTEGRATION TECHNOLOGY (SEPSIT). VOLUME 1: TECHNICAL SUMMARY
J. A. Gardner 15 Nov. 1972 177 p refs
(Contract NAS7-100)
(NASA-CR-130701; JPL-TM-33-583-Vol-1) Avail: NTIS HC $11.00 CSCL 21C

The use of solar electric propulsion as a means of exploring space beyond the reach of ballistic missions was investigated. The method used was to study the application of this new propulsion technology to a future flight project. A 1980 Encke rendezvous mission was chosen because a design successful for Encke could be used for less difficult, but scientifically rewarding, missions. Design points for the mission and for the thrust subsystem were specified. The baseline-vehicle design was defined. A preliminary functional description document for the thrust subsystem was originated. Analyses were performed in support of the design point selection for the SEP-module thrust subsystem to specify parameters, to clarify and optimize the interface requirements, and to assure feasibility of some of the more critical technological aspects of SEP application. Author

N73-17812*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLAR ELECTRIC PROPULSION SYSTEM INTEGRATION TECHNOLOGY (SEPSIT). VOLUME 2: ENCKE RENDEZ-VOUS MISSION AND SPACE VEHICLE FUNCTIONAL DESCRIPTION
J. A. Gardner 15 Nov. 1972 261 p refs
(Contract NAS7-100)
(NASA-CR-130702; JPL-TM-33-583-Vol-2) Avail: NTIS HC $15.25 CSCL 21C

A solar electric propulsion system integration technology study is discussed. Detailed analyses in support of the solar electric propulsion module were performed. The thrust subsystem functional description is presented. The space vehicle and the space mission to which the propulsion system is applied are analyzed. Author

N73-17813*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
SOLAR ELECTRIC PROPULSION SYSTEM INTEGRATION TECHNOLOGY (SEPSIT). VOLUME 3: SUPPORTING ANALYSES
J. A. Gardner 15 Nov. 1972 574 p refs
(Contract NAS7-100)
(NASA-CR-130703; JPL-TM-33-583-Vol-3) Avail: NTIS HC $30.75 CSCL 21C

For abstract see N73-17812

N73-17814*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
TWO-DIMENSIONAL CASCADE TEST OF A HIGHLY LOADED, LOW-SOLIDITY, TANDEM AIRFOIL TURBINE ROTOR BLADE
John F. Kline and Roy G. Stabe Washington Mar. 1973 19 p refs
(NASA-TM-X-2729; E-7216) Avail: NTIS HC $3.00 CSCL 21E

A tip region section of a low-solidity tandem airfoil blade for a turbine rotor was tested in a two-dimensional cascade tunnel at solidities of 0.736 and 0.912. Blade surface static pressures and blade exit total and static pressure and flow angle were surveyed. Blade surface velocities, wake shapes, and kinetic energy losses were analyzed and compared with values for 1.852 solidity tandem airfoil blading. Author

N73-17815*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.

EXPERIMENTAL INVESTIGATION OF AERODYNAMIC PERFORMANCE OF COOLED TURBINE VANES AT GAS-TO COLLANT-TEMPERATURE RATIOS UP TO 2.75
Roy G. Stabe and Robert P. Dengler Washington Mar. 1973 33 p refs
(NASA-TM-X-2733; E-7183) Avail: NTIS HC $3.00 CSCL 21E

The results of an experimental investigation of the aerodynamic performance of two geometrically similar turbine vanes with different cooling designs are presented. The test vanes were a convection-film-cooled vanes and a transpiration-cooled vane. A solid uncooled vane with the same aerodynamic profile as the cooled vane was also tested. Four vanes of each type were tested in an annular sector cascade. The cooled vanes were tested at primary to coolant temperature ratios of 1.0, 1.75, and 2.75 and a coolant to primary pressure ratios of 1.0, 1.2, and 1.5. This resulted in coolant flows up to about 10 percent of the primary flow. The principal measurements were surveys of vane exit total pressure, total temperature, and static pressure. The report includes a brief description of the test facility and the design of the test vanes. The test results presented include weight flow and efficiency data for the uncooled vanes and coolant flow, primary flow, and efficiency data as functions of the cooling variables for the cooled vanes. Author

N73-17816*# Hughes Research Labs., Malibu, Calif. Ion Device Physics Dept.
THRUST VECTORING SYSTEMS Final Report
H. J. King, D. Schnelker, J. W. Ward, C. Dulgeroff, and R. Vahrenkamp Dec. 1972 82 p refs
(Contract NAS3-15385)
(NASA-CR-121142) Avail: NTIS HC $6.25 CSCL 21C

The design, fabrication, and testing of thrust vectorable ion optical systems capable of controlling the thrust direction from both 5- and 30-cm diameter ion thrusters is described. Both systems are capable of greater than 10 deg thrust deflection in any azimuthal direction. The 5-cm system is electrostatic and hence has a short response time and minimal power consumption. It has recently been tested for more than 7500 hours on an operational thruster. The 30-cm system is mechanical, has a response time of the order of 1 min, and consumes less than 0.3% of the total system input power at full deflection angle. Author

N73-17817*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
PERFORMANCE COMPARISON OF THREE NORMAL-SHOCK POSITION SENSORS FOR MIXED-COMPRESSION INLETS
Miles O. Dustin and Gary L. Cole Washington Mar. 1973 29 p refs
(NASA-TM-X-2739; E-7197) Avail: NTIS HC $3.00 CSCL 21E

The performance of three types of normal shock position sensors for supersonic inlets is described. All three sensors determined the shock position from the presence of the large pressure gradient at the normal shock location. The logic means for the three sensors were: (1) electronic, using pressure transducers, (2) fluidic, and (3) direct-coupled pressure switches. The sensors were evaluated in a two-dimensional, Mach 2.7, supersonic inlet having 30-percent internal supersonic area contraction. Both dynamic (from 1 to 80 Hz) and static tests were conducted. Author

N73-17818# Instituto Nacional de Tecnica Aeroespacial, Madrid (Spain).
A COMPARATIVE STUDY OF CHEMICAL AND NONCHEMICAL PROPULSION SYSTEMS FOR ATTITUDE CONTROL AND ORBIT CORRECTION OF GEOSTATIONARY SATELLITES IN THE 500 TO 1000 kG CLASS. PART A: STATEMENT OF THE CHARACTERISTICS OF THE PROPULSION SYSTEMS
C. S. Tarifa, J. L. Urrutia, E. Fraga, A. Munoz, and A. Crespo Paris ESRO Jul. 1971 74 p refs
(Contract ESTEC-912/70)
(ESRO-CR-25-Pt-A) Avail: NTIS HC $5.75

A comparative study was made of chemical and nonchemical propulsion systems for the attitude control and orbit correction of geostationary satellites in the 500 kg to 1000 kg class. The systems studied are: hydrazine monopropellant thrustors; aerozine bipropellant thrustors; electrothermal (resistojet) types; electrostatic of the ionic type; electrostatic of the colloidal type, and radioisotope propulsion. Each system together with possible configurations is described. The systems' characteristics and modes of performance are also studied, with data being given for each on specific impulse, dry mass, thrust control, thrust vector control, response time, state of development, and reliability. ESRO

N73-17819# Rocketdyne, Canoga Park, Calif.
PULSE MODE PERFORMANCE MODEL Final Report, 1 Jul. 1970 - 21 Sep. 1972
W. D. Chadwick and L. P. Combs Nov. 1972 198 p refs
(Contract F04611-70-C-0074)
(AD-752610; R-8864; AFRPL-TR-72-16) Avail: NTIS CSCL 21/8

Development of a computerized pulse mode performance model is described, consisting of three distinct technical phases: model formulation, model programming, and model evaluation. The model was formulated and coded for digital computer solution to accurately simulate pulse mode performance operation of liquid bipropellant attitude control engines. The model consists of three primary subprograms that are fully integrated. Sample output data from the computer model are presented and discussed. Model evaluation consisted of conducting many computer runs (modifying the model as required) that simulated the performance of two rocket engines for which performance parameters and characteristics were known from hot-fire tests. Author (GRA)

N73-17820# Purdue Univ., Lafayette, Ind. Jet Propulsion Center.
PROJECT SQUID Semiannual Progress Report, 1 Apr. - 30 Sep. 1972
R. Adamson, F. Carta, P. Chung, J. Daiber, R. Dobbins, F. E. Fendell, J. Fenn, A. Fontijn, J. Howard, and S. Lederman 1 Oct. 1972 93 p refs
(Contract N00014-67-A-0226-0005; NR Proj. 098-038)
(AD-752037) Avail: NTIS CSCL 21/5

Reports of progress during the past six months of the 16 research programs comprising Project SQUID are presented. The research programs fall into the areas of Fluid Mechanics, Atomic and Molecular Collisions, Measurement Techniques, and Combustion and Chemical Rate Processes. Project SQUID is a cooperative program of basic research related to jet propulsion. It is administered by Purdue University and sponsored by the Office of Naval Research. Author (GRA)

N73-17821# Aerospace Research Labs., Wright-Patterson AFB, Ohio. Energy Conversion Research Lab.
EXPERIMENTS WITH HYPERMIXING NOZZLES IN AN AREA RATIO 23 EJECTOR Final Report
Brian Quinn Jun. 1972 48 p refs
(AF Proj. 7116)
(AD-752207; ARL-72-0084) Avail: NTIS CSCL 21/8

The performance of an inlet area ratio A1/A0 = 23 ejector was measured at pressure ratios between one and 1.3. No substantial pressure ratio effects were observed over this range. While the inlet conditions were fixed, four different combinations of mixing duct lengths and diffuser lengths were tested. The data indicate an advantage in apportioning most of the total length of the ejector to the diffuser. The longer constant area mixing ducts appeared to degrade ejector performance. Each of the four configurations exhibited the same trend: a general increase in augmentation ratio as the diffuser exit area increased. This tendency persisted up to the diffuser angle at which the diffuser stalled. Thereafter, the performance dropped abruptly. Author

N73-17822# Bendix Corp., South Bend, Ind. Energy Controls Div.
ULTRASONIC TRANSMISSION INVESTIGATIONS FOR TURBINE INLET GAS TEMPERATURE MEASUREMENT Final Report, Jan. 1971 - Jun. 1972
C. J. Ahern, C. S. Longstreet, B. R. Teitelbaum, and W. E. Werts Sep. 1972 291 p refs
(Contract F33615-71-C-1184; AF Proj. 3066)
(AD-752602; ECD-863-18249-R; AFAPL-TR-72-75) Avail: NTIS CSCL 21/5

For advanced turbine engine propulsion systems, the need for an accurate, fast response turbine inlet gas temperature measurement is becoming more acute. One of the potentially promising techniques is the ultrasonic gas gap approach which utilizes the transit time of a high-frequency acoustic pulse to determine the average gas temperature along a path through the sound supporting medium. The objective of this Air Force sponsored research and development effort was to ascertain the potential and limitations of such an approach. Based on engine noise tests conducted on a J85-7 turbojet engine and both bench and burner rig evaluations of candidate transmission approaches, a matched piezoelectric transmitter/receiver pair operating in a gated RF mode within the carrier frequency range of 200 to 500 kHz was selected as a prototype engine sensor.
Author (GRA)

N73-17823# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
SOLID FUEL ROCKET ENGINES, CHAPTER 16
V. A. Volodin 2 Nov. 1972 42 p Transl. into ENGLISH from the book "Konstrukt. i Proektir. Raketnykh Dvigatelei" Moscow, Izd.-vo Mashinostr., 1971 p 282-306
(AD-752865; FTD-MT-24-1364-72) Avail: NTIS CSCL 21/8
The report describes broadly the components and performance of solid propellant rocket motors. GRA

N73-17824# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
AIRCRAFT AND ROCKET: GET ACQUAINTED (SELECTED PORTION)
N. A. Zhemchuzhin and M. A. Levin 3 Nov. 1972 22 p Transl. into ENGLISH from the book "znakomtes, Samolet i Raketa" Moscow, Izd. vo Transp., 1971 p 134-144
(AD-752815; FTD-MT-24-1408-72) Avail: NTIS CSCL 21/8
The report is based on Soviet and foreign literature for a wide range of readers. It tells of the construction of multistage rockets, why they fly, how motors are used and how they are constructed. Author (GRA)

N73-17825# Air Force Systems Command, Wright-Patterson AFB, Ohio. Foreign Technology Div.
LOCAL HEAT TRANSFER OF GAS TURBINE BLADES ON SECTIONS WITH A LAMINAR BOUNDARY LAYER
N. B. Lebed 17 Oct. 1972 12 p refs Transl. into ENGLISH from Sudostroenie i Morsk. Sooruzheniya (USSR), no. 15, 1971 p 31-35
(AD-752676; FTD-HT-23-1404-72) Avail: NTIS CSCL 21/5
An approximate relation describing the local intensity of heat transfer in sections of profiles with laminar boundary flow was obtained on the basis of analysis of the integral relation for the thermal boundary layer considering the G. S. Ambrok expression regarding independence of the heat transfer law with respect to the velocity and temperature head gradients. The theoretical solution obtained agrees satisfactorily with the experimental data and is convenient for engineering calculations. Author (GRA)

N73-17826# STD Research Corp., Pasadena, Calif.
NONLINEAR TIME-DEPENDENT IN JxB DEVICES APPLICABLE TO MHD POWER GENERATORS AND ELECTRIC PROPULSION ENGINES Final Report
S. T. Demetriades, G. S. Argyropoulos, C. D. Maxwell, and S. A. Zwick Sep. 1972 95 p refs
(Contract F44620-70-C-0001; AF Proj. 9752)
(AD-751943; AFOSR-72-2181TR) Avail: NTIS CSCL 10/2
The report describes a realistic analytical method of modeling the time-dependent behavior of MHD generators and accelerators. This method can give accurate quantitative prediction of the performance and efficiency of a MHD generator channel as a function of its size, and can dictate the choice of operating conditions and geometry that will optimize the efficiency and longevity of a MHD power generator of a given size. It can simulate detailed, fluctuating dynamic behavior of segmented-electrode MHD power generators operating in an intermittent or burst mode, or steady-state MHD generators including the start up phase. The modeling is performed by numerical (digital) techniques. Author (GRA)

29 SPACE RADIATION

Includes cosmic radiation; solar flares; solar radiation; and Van Allen radiation belts. For related information see also: 13 Geophysics, and 24 Physics, Atomic, Molecular, and Nuclear.

N73-17827 George Washington Univ., Washington, D.C.
AN ATTEMPT TO EXPLAIN QUANTITATIVELY OBSERVED VARIATIONS IN THE FLUX DENSITIES OF SEVEN EXTRAGALACTIC RADIO SOURCES IN TERMS OF THE EXPANDING CLOUD MODEL Ph.D. Thesis
John Alphonse J. Waak 1972 191 p
Avail: Univ. Microfilms Order No. 72-16043
Results of the NRL program to monitor flux density variations of seven of the strongest of the previously known variable extragalactic radio sources at wavelengths of 0.95 cm and 1.55/1.65 cm are presented. Observations at both wavelengths were begun in mid-1966. The 0.95 cm observations were terminated after November 1969, while the 1.65 cm part of the program is continuing. An attempt is made to explain the detailed 1.55/65 cm variations in terms of the expanding cloud model of van der Laan and Shklovskii, but incorporating an acceleration parameter and a time invariant contribution. The outcome of this attempt was generally a contradiction between parameters derived from the increasing (optically thick) and decreasing (optically thin) portions of the radio light curves.
Dissert. Abstr.

N73-17828*# Colorado Univ., Boulder. Lab. for Atmospheric and Space Physics.
MONITORING OF SOLAR FAR ULTRAVIOLET RADIATION FROM THE OSO-5 SATELLITE Final Report, Jun. 1964 - Sep. 1972
William A. Rense and Robert Parker Sep. 1972 32 p refs
(Contract NAS5-3931)
(NASA-CR-130159) Avail: NTIS HC $3.75 CSCL 03B
A spectrophotometer for monitoring the solar EUV in three broad wavelength bands is described. The kind of data obtained, along with sources of error, are presented. The content of the tape library which contains the data is outlined. The scientific results are discussed. These include the following: solar flares in the EUV, solar eclipse observations in the EUV, SFD's and relationship to solar flares, and the application of satellite sunrise and sunset data for the study of model upper atmospheres for the earth. Author

N73-17829*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW ENERGY COSMIC RAY PROTONS FROM NUCLEAR INTERACTIONS OF COSMIC RAYS WITH THE INTERSTELLAR MEDIUM
H. T. Wang (Maryland Univ., College Park) Feb. 1973 15 p refs
(Grant NGR-21-002-033)
(NASA-TM-X-66181; X-661-73-27) Avail: NTIS HC $3.00 CSCL 03B
The flux of secondary protons below 100 MeV in interstellar space is calculated using detailed cross sections and kinematics for proton-proton, and proton-alpha particle interactions. Author

N73-17830*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
PRIMARY COSMIC RAY ELECTRONS ABOVE 10 GeV: EVIDENCE FOR A SPECTRAL BREAK
Robert F. Silverberg, Jonathan F. Ormes, and V. K. Balasubrahmanyan Jan. 1973 23 p refs
(NASA-TM-X-66182; X-664-73-30) Avail: NTIS HC $3.25 CSCL 03B
A balloon borne measurement of the cosmic ray electron spectrum from 10 to 200 GeV is reported in which two new techniques have been used to remove proton background contamination. First, the depth of the spectrometer was more than 25 radiation lengths, the equivalent of more than 2 mean free paths of material, enabling hadronically and electromagnetically induced cascades to be differentiated for a subset of the data. Second, electromagnetic cascade starting points were

determined to within + or - 0.1 radiation lengths based upon a calibration with electrons from 5.4 to 18 GeV at the Stanford Linear Accelerator, greatly reducing the chances for a proton to simulate an electron. The resulting spectrum, when fitted with a power law, is quite steep, -3.2 + or - 0.1, but the chi-square fit is marginal. A significantly better fit is achieved assuming a transition region model in which the source spectral index is 2.7 with a break occurring at about 50 GeV. Author

N73-17831*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena. Mission Analysis Div.

THE SOLAR RADIATION PRESSURE ON THE MARINER 9 MARS ORBITER

R. M. Georgevic 15 Dec. 1972 27 p refs
(Contract NAS7-100)
(NASA-CR-130724; JPL-TM-33-582) Avail: NTIS HC $3.50 CSCL 03B

The refined mathematical model of the force created by the light pressure of the Sun was used to compute the solar radiation pressure force acting on the Mariner 9 (Mariner Mars 1971) spacecraft, taking into account the reflectivity characteristics of all its components. The results were compared with values obtained from Mariner 9 observations during the cruise phase and found to be in agreement within 0.1% of the values.
Author

N73-17832*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.

CALCULATION OF ENERGY DEPOSITION DISTRIBUTIONS FOR SIMPLE GEOMETRIES

John W. Watts, Jr. Washington Mar. 1973 66 p refs
(NASA-TN-D-7195; M452) Avail: NTIS HC $3.00 CSCL 03B

When high-energy charged particles pass through a thin detector, the ionization energy loss in that detector is subject to fluctuations or straggling which must be considered in interpreting the data. Under many conditions, which depend upon the charge and energy of the incident particle and the detector geometry, the ionization energy lost by the particle is significantly different from the energy deposited in the detector. This problem divides naturally into a calculation of the energy loss that results in excitation and low-energy secondary electrons which do not travel far from their production points, and a calculation of energy loss that results in high-energy secondary electrons which can escape from the detector. The first calculation is performed using a modification of the Vavilov energy loss distribution. A cutoff energy is introduced above which all electrons are ignored and energy transferred to low energy particles is assumed to be equivalent to the energy deposited by them. For the second calculation, the trajectory of the primary particle is considered as a source of secondary high-energy electrons. The electrons from this source are transported using Monte Carlo techniques and multiple scattering theory, and the energy deposited by them in the detector is calculated. The results of the two calculations are then combined to predict the energy deposition distribution. The results of these calculations are used to predict the charge resolution of parallel-plate pulse ionization chambers that are being designed to measure the charge spectrum of heavy nuclei in the galactic cosmic-ray flux. Author

N73-17833# Bergen Univ. (Norway). Dept. of Physics.

COSMIC RAY 27-DAY RECURRENCES DURING 1965 - 1969

A. M. Aksland and R. Amundsen Jun. 1972 26 p refs
(NP-19466; Rept-42) Avail: AEC Depository Libraries

The 27-day variation in neutron monitor data was analyzed according to three methods of analysis, autocorrelation, Chree, and power spectrum. The years 1965 to 1969 were investigated, and the period from minimum to maximum activity in solar cycle No. 20. The periodic length of the 27-day recurrences was found to decrease from 31.5 days during start of cycle to 27.5 days towards maximum of activity. The most persistent recurrences occurred during 1967 to 1969. The amplitude was found to vary with the level of solar activity; it was lowest during start of new cycle and increased with increasing activity towards a limit reached in 1966. The amplitude was kept roughly at this value for 31/2 years onwards, while the solar activity steadily increased, and indicated a saturation of the modulation. The cosmic ray 27-day recurrences were compared with corresponding variations found in solar wind speed, interplanetary field direction, photospheric field and coronal line (lambda 5303) intensity, and phase relations with geomagnetic activity and solar activity are discussed. Author (NSA)

N73-17834# Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.

COSMIC RAY MT-64 MUON MONITOR DATA. 6: FROM SOLAR ROTATION 1867 TO ROTATION 1879, 17 JANUARY 1970 - 2 JANUARY 1971

J. F. Steljes Apr. 1972 93 p refs
(AECL-4207) Avail: AEC Depository Libraries; Atomic Energy of Can., Ltd., Chalk River $2.00

Hourly rates corrected for atmospheric temperature and pressure from four cosmic ray stations in Canada and from a survey monitor stationed at Kula, Hawaii, are given in tabular form by solar rotation for the period from the begining of Rotation 1867 to the end of Rotation 1879 (January 17, 1970 to January 2, 1971). The Dorman-Maeda temperature correction factors for each station calculated at 12-hour intervals from the radiosonde data of the Canadian Meteorological Branch or the U.S. Weather Bureau are also listed. Barometric pressures are available from neutron monitor data reports already published. Graphs of the relative hourly rates at each station are given.
Author (NSA)

N73-17835# Air Force Cambridge Research Labs., L. G. Hanscom Field, Mass. Ionospheric Physics Lab.

FORECASTING PEAK PROTON FLUX AND PCA EVENT MAGNITUDES USING "FLASH-PHASE" INTEGRATED RADIO-BURST FLUX DENSITY Interim Report

David T. Newell 23 Aug. 1972 33 p refs
(AD-751925; AFCRL-72-0543; AFCRL-ERP-415) Avail: NTIS CSCL 04/1

A new parameter is introduced for use in forecasting the magnitudes of solar proton and polar cap absorption events. Semi-integrated flux density is the integrated radio flux density under the start-to-maximum burst curve. An approximation to this function was correlated at five operational frequencies against both observed peak proton flux and observed riometer absorption, obtaining correlation coefficients > or = 0.88 at frequencies between 2695- and 8800-MHz. An operational real-time forecast scheme is detailed for the solar forecaster. Results from this study, which uses peak proton fluxes both corrected and uncorrected for solar disk positions, indicate that forecasts have a higher degree of correlation with observations if propagation corrections are not applied as present methods dictate. When used in conjunction with the Castelli U burst spectrum criteria for forecasting the occurrence of proton events, radio data can be used exclusively for both a yes/no and an event magnitude forecast. A comparison with the method presently in use at the Air Weather Service's Aerospace Environmental Support Center, Solar Forecast Branch is made with very favorable results.
Author (GRA)

N73-17951* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

SOLAR WIND MAINTENANCE OF THE NIGHTTIME VENUS IONOSPHERE

Richard E. Hartle *In its* Significant Accomplishments in Sci., 1971 1972 p 79-82 ref (For availability see N73-17934 08-34)
CSCL 03B

N73-17952* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ION CLUSTERS AND THE VENUS ULTRAVIOLET HAZE LAYER

Arthur C. Aikin *In its* Significant Accomplishments in Sci., 1971 1972 p 83-87 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17956* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

THEORETICAL LIMITS ON JOVIAN RADIO BELTS

Fritz M. Newbauer *In its* Significant Accomplishments in Sci., 1971 1972 p 108-110 ref (For availability see N73-17934 08-34)
CSCL 03B

N73-17958* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSPORT OF COSMIC RAYS IN THE SOLAR CORONA
Kenneth H. Schatten *In its* Significant Accomplishments in Sci., 1971 1972 p 117-121 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17959* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR PARTICLE COMPOSITION MEASUREMENTS
Donald V. Reames *In its* Significant Accomplishments in Sci., 1971 1972 p 122-125 ref (For availability see N73-17934 08-34)
CSCL 03B

N73-17960* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CHARGE SPECTRA OF SOLAR COSMIC RAYS
Tycho T. VonRosenvinge *In its* Significant Accomplishments in Sci., 1971 1972 p 126-130 ref (For availability see N73-17934 08-34)
CSCL 03B

N73-17962* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUIETTIME ELECTRON INCREASES
Leonard A. Fisk *In its* Significant Accomplishments in Sci., 1971 1972 p 135-138 ref (For availability see N73-17934 08-34)
CSCL 03B

N73-17963* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY CHARGE AND ENERGY SPECTRA ABOVE 10 GeV
Johnathan F. Ormes *In its* Significant Accomplishments in Sci., 1971 1972 p 139-145 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17964* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SURVIVAL OF HEAVY NUCLEI IN COSMIC RAY SOURCE ENVIRONMENTS
V. K. Balasubrahmanyan *In its* Significant Accomplishments in Sci., 1971 1972 p 146-150 (For availability see N73-17934 08-34)
CSCL 03B

N73-17966* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPRATHERMAL PROTON BREMSSTRAHLUNG
Frank C. Jones *In its* Significant Accomplishments in Sci., 1971 1972 p 155-159 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17968* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE X-RAYS FROM THE GALACTIC DISK
Peter J. Serlemitsos *In its* Significant Accomplishments in Sci., 1971 1972 p 165-169 (For availability see N73-17934 08-34)
CSCL 03B

N73-17969* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR X-RAY TEMPORAL VARIATIONS
Stephen S. Holt *In its* Significant Accomplishments in Sci., 1971 1972 p 170-174 (For availability see N73-17934 08-34)
CSCL 03B

N73-17978* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APOLLO 15 X-RAY FLUORESCENCE EXPERIMENT
Isidore Adler *In its* Significant Accomplishments in Sci., 1971 1972 p 208-213 (For availability see N73-17934 08-34)
CSCL 03B

30 SPACE SCIENCES

Includes astronomy and astrophysics; cosmology; lunar and planetary flight and exploration; and theoretical analysis of orbit and trajectory. For related information see also: 11 Facilities, Research and Support; and 31 Space Vehicles.

N73-17836 Minnesota Univ., Minneapolis.
HEAVY RARE GASES IN SELECTED METEORITES AND TERRESTRIAL MATERIALS Ph.D. Thesis
Douglas Leroy Phinney 1971 121 p
Avails: Univ. Microfilms Order No. 72-14353

Kr and Xe abundance and isotopic data are reported for stepwise heating experiments on three meteorites (Mokoia, Novo Urei, and Allende) and for melt extractions on samples of five terrestrial sedimentary rocks. The intermediate-high temperature Xe data support the carbonaceous chondrite fission hypothesis. An anomalous component, most prominent at intermediate temperatures in Mokoia and Allende, is observed and tentatively ascribed to spallation from a very high energy proton irradiation. The trapped Xe component released at intermediate-high temperature fractions of Novo Urei and Mokoia appears to be related to atmospheric Xe by a mass fractionation process, in agreement with previous research. Despite the absence of clearly defined linear correlations in the meteoritic Kr data, it is concluded that at least three trapped components are necessary to account for the observed isotopic variations. Dissert. Abstr.

N73-17837 Connecticut Univ., Storrs.
ATTENUATION OF SURFACE ELASTIC WAVES AND RELATED PROBLEMS Ph.D. Thesis
Richard George Steg 1971 128 p
Avail: Univ. Microfilms Order No. 72-14258

Scattering of surface waves by four types of mass defects is considered. For defects near the surface most of the energy is scattered into other surface waves rather than into body waves and so the energy of surface waves is retained and leaks into the interior relatively slowly. With a high concentration of randomly distributed defects the energy of the surface waves also remains concentrated in a small area for a long period of time. This fact is used to explain the duration of the seismic signals which have recently been observed on the moon. It is concluded that the compressed material under the crater floor accounts for the long duration of seismic signals and that the finite vertical line defect provides a good approximation to this scattering center. The theoretical curves are fitted to spectrograms from which values for the depth of the compressed material and intrinsic attenuation of surface waves at 0.4 Hz are estimated. Dissert. Abstr.

N73-17838 Princeton Univ., N.J.
ROCKET ULTRAVIOLET SPECTRA OF DELTA SCORPII AND ZETA OPHIUCHI Ph.D. Thesis
Terry Allen Matilsky 1971 57 p
Avail: Univ. Microfilms Order No. 72-14158

High quality ultraviolet spectra of Delta Scorpii (BOV) and Zeta Ophiuchi (09.5V) were obtained from an Aerobee rocket carrying two Schmidt cameras. Two spectra were obtained for each target; for Delta Scorpii, the region from 1110A to 1400A was recorded with approximately 0.5A resolution, as well as 1100 to 1500A at 1.5A resolution; for Zeta Ophiuchi, the high resolution spectrum extended from 1190A to 1500A and the low resolution spectrum recorded 1100 to 1750A. Photospheric lines of C 2, C 3, C 4, Si 3, Si 4, and S 3 have been positively identified along with interstellar lines of H 1, o 1, C 2, and Si 2 and possible C 1, N 1, Al 2, ans Si 2. Theoretical line profiles were calculated from recently derived electron Stark broadening damping constants and line-blanketed LTE model atmospheres, and were compared with observed equivalent widths and line profiles. Agreement between theory and observation is generally good. Dissert. Abstr.

N73-17839 Michigan Univ., Ann Arbor.
AN OBSERVATIONAL STUDY OF RADIO GALAXIES Ph.D. Thesis
Mark Alan Stull 1971 101 p
Avail: Univ. Microfilms Order No. 72-15008

Measurements have been made of the 8000-MHz flux densities of 60 Parkes Catalogue Radio Galaxies with the University of Michigan 85-foot radio telescope. The radio spectra of these galaxies were formed by combining the 8000-MHz data with as many flux density measurements at frequencies between 10 and 10,000 MHz as could be found for them in the literature. The principal conclusion concerning the spectra of the galaxies are summarized as follows: (1) When spectra of radio galaxies are extended to class C(+) increases over that found in surveys at lower frequencies. (2) Spectral curvature is more readily detected when one has a large number of flux density measurements over a wide range of frequencies. (3) Complex spectral curvature is rare. The spectra of all the galaxies in this sample can be represented by simple first and second order curves. (4) The correlation between spectral index and luminosity reported by Kellermann, Pauliny-Toth, and Williams (1969) is also found at 250 MHz, but not at 8000 MHz.
Dissert. Abstr.

N73-17840 Florida Univ., Gainesville.
STRUCTURE IN CLUSTERS OF GALAXIES Ph.D. Thesis
Robert Wyatt Davis 1971 121 p
Avail: Univ. Microfilms Order No. 72-15668

The large discrepancy between masses of clusters of galaxies determined by using the Virial theorem and that determined from the luminosity of the individual galaxies is examined to see if it is influenced by structure within the cluster in the form of fine scale subclustering. The influence of this effect is found to be on the order of only a few percent. However, it is suggested that subclustering within a cluster will strongly influence determination of the cluster age bases upon the concept of equal partition of energy. Several methods of analyzing the structure of clusters of galaxies are developed, including an improved least squares technique for developing an optimal contour map of the region of the cluster and a Chi Square test for a locally random distribution with a large scale functional dependence.
Dissert. Abstr.

N73-17841*# Arizona Univ., Tucson. Field Emission and Space Systems Lab.
DETECTION TECHNIQUES FOR TENUOUS PLANETARY ATMOSPHERES Semiannual Report, 1 Jan. - 30 Jun. 1972
Stuart A. Hoenig 30 Jun. 1972 76 p refs
(Grant NGL-03-002-019)
(NASA-CR-130700; SAR-18) Avail: NTIS HC $6.00 CSCL 03B

The research for the development of new types of detectors for analysis of planetary atmospheres is summarized. Topics discussed include: corona discharge humidity detector, surface catalysis and exo-electron emission, and analysis of soil samples by means of exo-electron emission. A report on the exo-electron emission during heterogeneous catalysis is included.
F.O.S.

N73-17842*# Northeast Radio Observatory Corp., Westford, Mass. Haystack Observatory.
HAYSTACK OBSERVATORY Semiannual Report
15 Jul. 1972 42 p refs Prepared in cooperation with MIT
(Contract NAS9-7830; Grant NGR-22-174-003; Contracts F23601-71-C-0092; F19628-70-C-0230; Grant NSF GP-25865)
(NASA-CR-130756) Avail: NTIS HC $4.25 CSCL 03B

Among the 32 presently active radio astronomy programs, 15 are spectral line research, 8 involve continuum measurements, 2 are Haystack-Westford short baseline interferometer projects, 5 are VLBI experiments and 2 used the spectrometric receiver with a small horn antenna. Radiometric programs involve the planetary radar, and 2 of these use the Haystack-Westford interferometer to receive the echoes.
Author

N73-17843*# GCA Corp., Bedford, Mass. Technology Div.
MARCH 7, 1970 SOLAR ECLIPSE INVESTIGATION Final Report
Carl A. Accardo Oct. 1972 81 p refs
(Contract NASw-1993)
(NASA-CR-130698; GCA-TR-72-1-N) Avail: NTIS HC $6.25 CSCL 03C

Studies from rockets directed toward establishing the solar X-ray fluxes during the 7 March 1970 total eclipse over the North American continent are reported. A map of the eclipse path is presented. The measured absorption profiles for the residual X-rays are useful in establishing their contribution to the D and E region ionization during the eclipse. The studies were performed with two Nike-Apache payloads launched over Wallops Island, Virginia. In addition to three X-ray detectors in the 1 to 8A, 8 to 20A and 44 to 60A bands, there was included in the payloads two additional experiments. These were an electric field experiment and an epithermal photoelectron experiment. The X-ray instrumentation, payload description, flight circumstances and finally, the X-ray results obtained are described. The various computer codes employed for the purpose of reducing the telemetered data as well as the eclipse codes are included.
Author

N73-17844*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
SOLAR NEUTRINOS AND THE INFLUENCES OF OPACITY, THERMAL INSTABILITY, ADDITIONAL NEUTRINO SOURCES, AND A CENTRAL BLACK HOLE ON SOLAR MODELS
R. B. Stothers and D. Ezer [1972] 14 p refs
(NASA-TM-X-68847) Avail: NTIS HC $3.00 CSCL 03B

Significant quantities that affect the internal structure of the sun are examined for factors that reduce the temperature near the sun's center. The four factors discussed are: opacity, central black hole, thermal instability, and additional neutrino sources.
F.O.S.

N73-17845*# Massachusetts Inst. of Tech., Cambridge. Center for Space Research.
X-RAY ASTRONOMY FROM SOUNDING ROCKETS AT MIT Final Report, 1 Jun. 1966 - 31 Oct. 1971
31 Oct. 1971 31 p refs
(Contract NSR-22-009-129)
(NASA-CR-130749) Avail: NTIS HC $3.75 CSCL 03A

The research in the program for designing and fabricating payloads for sounding rockets for use in X-ray astronomy is reported. Published papers concerning six Aerobee flights are presented. The results include: (1) the establishment of the radio galaxy M87 as an X-ray source; (2) the studies of the pulsar NP0532, including its X-ray pulse shape, the determination of the synchronism of the optical and X-ray pulses and the codiscovery of its existence as an X-ray pulsar; (3) the determination of many X-ray source positions, and (4) the precise position of Cyg X-1 which led directly to the identification of a ninth magnitude BO supergiant.
F.O.S.

N73-17846*# National Aeronautics and Space Administration. Goddard Inst. for Space Studies, New York.
EVOLUTION OF STARS WITH SUPPRESSED CORE CONVECTION
Richard B. Stothers and Chao-Wen Chin [1972] 15 p refs
(NASA-TM-X-68944) Avail: NTIS HC $3.00 CSCL 03A

Stellar evolution on the upper main sequence was computed for models of stars with cores assumed to be in radiative equilibrium, up to the point of central helium ignition. The role of the Schonberg-Chandrasekhar limit for an isothermal core is found to be critical for the evolutionary tracks. Observational data are used to rule out the hypothesis of evolution with radiative cores (in upper main-sequence stars) and, by implication, of magnetic fields that are sufficiently strong to have suppressed the core convention.
Author

N73-17847*# Maryland Univ., College Park. Dept. of Physics and Astronomy.
A STOCHASTIC MODEL OF THE GALACTIC MAGNETIC FIELD
Thomas B. Kaiser Sep. 1972 25 p refs
(Grant NGL-21-002-033)
(NASA-CR-130158; TR-73-034) Avail: NTIS HC $3.25 CSCL 03B

Existing stochastic models of the galactic magnetic field are

considered and found to suffer certain defects. A new model is proposed which overcomes faults of the previous theories while retaining their strengths. Author

N73-17848# Royal Greenwich Observatory, Herstmonceux (England).
COMPUTER PROGRAMMES FOR DIFFERENTIAL CURVE-OF-GROWTH ANALYSIS
A. L. T. Powell 1971 22 p refs
(Bull-171) Avail: NTIS HC $3.25; Royal Greenwich Observatory, Herstomonceux 35p

A description is given of a computer program which undertakes a complete curve-of-growth analysis, using measurements of the dimensions of stellar lines as input data. The program performs the analysis in a number of distinct stages and the final results are presented in graphic and tabular form. This procedure permits a very flexible analysis by exercising options at each stage. Author

N73-17849# Royal Greenwich Observatory, Herstmonceux (England).
PHOTOMETRIC STANDARD STARS
A. W. J. Cousins 1971 86 p refs
(Annals-7) Avail: NTIS HC $6.50; Royal Greenwich Observatory, Herstmonceux £1.15

The magnitudes and colors are given for 900 stars brighter than magnitude 5.0 in the Revised Haravard Photometry and south of +10 deg declination, reduced to the UBV system of 1966. Weighted mean v magnitudes and B-V colors based on the best series available up to the end of 1966 are tabulated and are believed to provide a consistent system over the southern sky. The U-B data are given for most of the stars and are reasonable consistent for single main sequence stars earlier than spectral type G and for normal giants of the later types. There are appreciable differences for some stars, and individual values are included for them. Author

N73-17850# Belgian Royal Observatory, Brussels.
YEARBOOK OF THE BELGIAN ROYAL OBSERVATORY [ANNUAIRE DE L'OBSERVATORIE ROYAL DE BELGIQUE]
1973 234 p refs In FRENCH and FLEMISH
Avail: NTIS HC $13.75

Work reported during 1973 includes monthly measurement tables of stellar and planetary magnitudes, general observations of the solar system, and observations of various comets. Transl. by G.G.

N73-17851*# National Aeronautics and Space Administration. Ames Research Center, Moffett Field, Calif.
THE INDUCED MAGNETOSPHERE OF THE MOON. 1: THEORY
G. Schubert (Calif. Univ., Los Angeles), C. P. Sonett, K. Schwartz (Schwartz, (K), Woodland Hills, Calif.), and H. J. Lee (Calif. Univ., San Diego) Jan. 1973 59 p refs
(NASA-TM-X-62227) Avail: NTIS HC $5.00 CSCL 03B

An analytic solution for the magnetic field in the space defined by a spherical moon and its downstream cylindrical cavity formed by the solar wind is derived for interplanetary magnetic fields both parallel and perpendicular to the cavity axis. By superposition, the solution is obtained for arbitrary orientations of the interplanetary field. The theory is quasi-static and is formulated in terms of a scalar magnetic potential. Thus the moon model consists of a core of arbitrary size and infinite electrical conductivity surrounded by a nonconducting shell; the cavity volume is assumed to be nonconducting. The variation of the magnetic field on the lunar surface, both on the sunlit and on the dark side hemispheres, and on the cavity boundary is presented for various values of core radius. The solution yields the distribution of currents on the lunar sunlit surface and the surface of the cavity. Theoretical transfer functions are presented and their variations with position on the lunar surface and with core size are discussed. Author

N73-17852*# Massachusetts Inst. of Tech., Cambridge.
[SPECTRAL LINE AND CONTINUUM STUDIES USING HAYSTACK ANTENNA] Semiannual Report
15 Jan. 1973 36 p refs Prepared for Northeast Radio Obs. Corp.
(Contract NAS9-7830; Grant NGR-22-174-003; Contract F23601-71-C-0092; Grant NSF GP-25865)
(NASA-CR-130673) Avail: NTIS HC $4.00 CSCL 03A

During the last half of 1972, the Haystack antenna was utilized 88% of the time. Of this useful time, 81% was devoted to radio astronomy investigations, 8% was spent on radar-related research and 11% was scheduled for maintenance and system improvements. Thirteen programs were completed of which 10 were spectral-line studies involving primarily recombination lines and H2O vapor investigations. The others involved 2 cm and 1.3 cm continuum observations. Fifteen new programs were accepted and the currently active radio observing programs totalled 24 as of 31 December 1973. The last radar measurements in the lunar topography program have now been completed. Radar activity, including measurements on Mercury, Venus and synchronous satellites has continued. Author

N73-17853# Joint Publications Research Service, Arlington, Va.
ENVIRONMENTAL RESEARCH BY MEANS OF MANNED SPACE STATIONS, PART 2
K. Ya. Kondratyev et al 24 Jan. 1973 173 p refs Transl. into ENGLISH of the book "Issledovaniya Prirodnoy Sredy s Pilotiruyemykh Orbitalnykh Stansiy" Leningrad, 1972
(JPRS-58055-2-Pt-2) Avail: NTIS HC $10.75

An analysis is reported of visual observation data gathered by Soviet manned spacecraft. A discussion of problems concerning photography methods and photointerpretation from space, and an analysis of the potential uses of space spectrophotometry methods for studying the earth environment and natural resources are included. Author

N73-17854*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
ASCENT CONTROL STUDIES OF THE 049 AND ATP PARALLEL BURN SOLID ROCKET MOTOR SHUTTLE CONFIGURATIONS
Robert S. Ryan, David K. Mowery, Morris Hammer, and A. C. Weisler Nov. 1972 109 p refs
(NASA-TM-X-64720) Avail: NTIS HC $7.50 CSCL 22A

The control authority approach is discussed as a major problem of the parallel burn soil shuttle configuration due to the many resulting system impacts regardless of the approach. The major trade studies and their results, which led to the recommendation of an SRB TVC control authority approach are presented. Author

N73-17855# Instituto y Observatorio Astronomico de Marina, San Fernando (Spain).
ASTRONOMICAL EPHEMERIDES FOR 1973 [EFEMERIDES ASTRONOMICAS, 1973]
1973 619 p In SPANISH
Avail: NTIS HC $33.00; Instituto y Observatorio de Marina, San Fernando (Cadiz), Spain: 200 pesetas

The nautical almanac (astronomical ephemerides) for 1973 is presented. The ephemerides for the sun, planets, moon and stars are tabulated. Tables for computing local mean time are included along with interpolation tables. Transl. by F.O.S.

N73-17856# Royal Greenwich Observatory, Herstmonceux (England).
GREENWICH TIME REPORT, JANUARY - MARCH 1972
Mar. 1972 20 p
Avail: NTIS HC $3.00

The results of the Greenwich Time and Latitude Service for the period of January to March 1972 inclusive are reported. Explanations of the terms used are given. Commencing on 1 Jan. 1972 in accordance with international agreements the standard frequency and time service emissions were adjusted so that the time signals differ from the International Atomic Time Scale by an integral number of seconds. The rate is in agreement with the International Time Scale so that time intervals conform to the definition of the SI second. Author

N73-17857*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TIDAL PERTURBATIONS ON THE ORBITS OF GEOS-1 AND GEOS-2
B. C. Douglas (Wolf Res. and Develop. Corp., Riverdale Md.), S.

M. Klosko (Wolf Res. and Develop. Corp., Riverdale, Md.), J. G. Marsh, and R. G. Williamson (Wolf Res. and Develop. Corp., Riverdale, Md.) Dec. 1972 30 p refs Submitted for publication (NASA-TM-X-66176; X-553-72-475) Avail: NTIS HC $3.50 CSCL 22C

Analysis of the luni-solar tidal perturbations of the inclination of GEOS-1 (1965-89A) and GEOS-2 (1968-002A) yielded the values k2 = 0.22 (sigma = 0.02) and 0.31 (sigma = 0.01) respectively for the second degree Love number. For GEOS-1 a new, purely numerical method involving osculating elements was employed. For GEOS-2 it was necessary to analyze the variations of the mean elements because of the very long period (450d) of the dominant solar tidal perturbation. An additional analysis of the variation of the mean elements of GEOS-1 confirmed the value of k2 obtained from the osculating elements. Author

N73-17858*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

ON THE TIDAL EFFECTS IN THE MOTION OF EARTH SATELLITES AND THE LOVE PARAMETERS OF THE EARTH

Peter Musen and Ronald Estes Dec. 1972 33 p refs (NASA-TM-X-66173; X-550-72-500) Avail: NTIS HC $3.75 CSCL 22C

The tidal effects in the motion of artificial satellites are studied to determine the elastic properties of the earth as they are observed from extraterrestrial space. Considering Love numbers, the disturbing potential is obtained as the analytical continuation of the tidal potential from the surface of the earth into-outer space, with parameters which characterize the earth's elastic response to tidal attraction by the moon and the sun. It is concluded that the tidal effects represent a superposition of a large number of periodic terms, and the rotation of the lunar orbital plane produces a term of 18 years period in tidal perturbations of the ascending node of the satellite's orbit. F.O.S.

N73-17859*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.

AN ALGORITHM FOR TARGETING FINITE BURN MANEUVERS

R. W. Barbieri and G. H. Wyatt Dec. 1972 26 p refs Submitted for publication (NASA-TM-X-66180; X-551-73-6) Avail: NTIS HC $3.00 CSCL 22A

An algorithm was developed to solve the following problem: given the characteristics of the engine to be used to make a finite burn maneuver and given the desired orbit, when must the engine be ignited and what must be the orientation of the thrust vector so as to obtain the desired orbit? The desired orbit is characterized by classical elements and functions of these elements whereas the control parameters are characterized by the time to initiate the maneuver and three direction cosines which locate the thrust vector. The algorithm was built with a Monte Carlo capability whereby samples are taken from the distribution of errors associated with the estimate of the state and from the distribution of errors associated with the engine to be used to make the maneuver. Author

N73-17860# Joint Publications Research Service, Arlington, Va.

SOVIET BLOC RESEARCH IN GEOPHYSICS, ASTRONOMY, AND SPACE, NO. 293

31 Jan. 1973 47 p Transl. into ENGLISH from Russian reports (JPRS-58112) Avail: NTIS HC $4.50

Translations and abstracts are presented of articles on meteorology, oceanography, upper atmosphere and space research, astronomy, and terrestrial geophysics, covering both science news and formal scientific reports. Author

N73-17861*# Kanner (Leo) Associates, Redwood City, Calif.

THE CONQUEST OF OUTER SPACE

Torquato Gualtierotti Washington NASA Feb. 1973 17 p Transl. into ENGLISH of "La Conquista dello Spazio Esterno" Sponsored by NASA (NASA-TT-F-14836) Avail: NTIS HC $3.00 CSCL 22C

On the basis of the results of the OFO-A vestibular experiment on the activity of the inner ear and its control of equilibrium and the muscular and visceral systems under conditions of weightlessness, it is concluded that introduction of artificial gravity aboard spacecraft is not indispensable. Should this state of affairs be confirmed for other systems of the organism, the final conclusion would be that man can adapt himself to weightlessness and therefore to living in space and on planets with a low gravitational attraction. Furthermore, closed-cycle oxygen and water bioregeneration systems could then be designed for zero environments. Finally, with the techniques invented for the requirements of the space experiment, the activity of individual elements of any biological system in normal (untraumatized) animals can be studied. Author

N73-17862*# Martin Marietta Corp., Denver, Colo. Planetary Systems Mission Analysis and Operations Section.

LOW THRUST ORBIT DETERMINATION PROGRAM Final Report

P. E. Hong, G. L. Shults, K. R. Huling, and C. W. Ratliff Dec. 1972 263 p refs (Contract NAS1-11686) (NASA-CR-112256; MCR-72-292) Avail: NTIS HC $15.25 CSCL 22A

Logical flow and guidelines are provided for the construction of a low thrust orbit determination computer program. The program, tentatively called FRACAS (filter response analysis for continuously accelerating spacecraft), is capable of generating a reference low thrust trajectory, performing a linear covariance analysis of guidance and navigation processes, and analyzing trajectory nonlinearities in Monte Carlo fashion. The choice of trajectory, guidance and navigation models has been made after extensive literature surveys and investigation of previous software. A key part of program design relied upon experience gained in developing and using Martin Marietta Aerospace programs: TOPSEP (Targeting/Optimization for Solar Electric Propulsion), GODSEP (Guidance and Orbit Determination for SEP) and SIMSEP (Simulation of SEP). Author

N73-17863*# Kanner (Leo) Associates, Redwood City, Calif.

THE MARS-2 AND MARS-3 ORBITAL SPACECRAFT: RESULTS OF THE INVESTIGATION OF THE MARTIAN SURFACE AND ATMOSPHERE

V. I. Moroz Washington NASA Feb. 1973 20 p refs Transl. into ENGLISH of the manuscript "Orbitalnyye App. Mars-2 i Mars-3: Rezultaty Issled. Poverkhn. i Atm. Marsa" Moscow, 1973 19 p (Contract NASw-2481) (NASA-TT-F-14814) Avail: NTIS HC $3.00 CSCL 03B

Six different experiments were conducted on the Mars 2 and Mars 3 orbital spacecraft studying the Martian surface and lower atmosphere during and after a dust storm. Surface temperature, soil temperature, dielectric constant, relative altitudes at the planetary surface, surface brightness, H2O content, and the density of the lower atmospheric neutral gas and the electronic density of the ionosphere were determined. Instruments used included an infrared radiometer, radiotelescope, CO2 and H2O photometers, and a photometer in the 3700 to 6940 A range. Author

N73-17864*# Kanner (Leo) Associates, Redwood City, Calif.

PRELIMINARY RESULTS OF THE MEASUREMENT OF THE WATER CONTENT OF THE MARTIAN ATMOSPHERE MADE BY THE MARS-3 AUTOMATIC INTERPLANETARY STATION

V. I. Mozov, A. Z. Nadzhip, A. B. Gilvarg, F. A. Korolev, and V. C. Zhegulev Washington NASA Feb. 1973 10 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (Moscow), v. 208, no. 4, 1972 p 45-48 (Contract NASw-2481) (NASA-TT-F-14815) Avail: NTIS HC $3.00 CSCL 03B

IR absorption measurements were made in the 1.38 micron band. Since the expected equivalent width of the key band is small, interference-polarization (modulation) could be used. The phase detected signal was calibrated to give the equivalent width of the 1.3827 mu line, and a power function related this preliminarily to P and moisture density in the subsatellite column. The readings obtained are presented and their significance discussed. Author

N73-17865*# Kanner (Leo) Associates, Redwood City, Calif.
PRELIMINARY RESULTS OF THE INVESTIGATION OF THE MARTIAN ATMOSPHERE WITH THE MARS-2 SATELLITE
M. A. Kolosov, O. I. Yakovlev, Yu. M. Kruglov, B. N. Trusov, A. I. Yefimov, and V. V. Kerzhanovich Washington NASA Feb. 1973 7 p Transl. into ENGLISH from Dokl. Akad. Nauk SSSR (USSR), v. 206, no. 5, 1972 p 1071-1073
(Contract NASw-2481)
(NASA-TT-F-14817) Avail: NTIS HC $3.00 CSCL 03B

Radioscopic observations at lambda = 32 were performed. Frequency changes gave refraction indices, which depend on electron concentration (ionosphere) and P and T (troposphere), and are found as a function of altitude, which turns out to be exponential. Temperature gradients found were low - less than 1.5 K/km altitude. Curves of P, f change, and electron concentration are given. Parameters found include: pressure near the nominal surface, 7.0 + or - 2 mbar; concentration of atoms at the surface, (2.3 + or - 0.7)x 10 to the 17th power/cu cm; temperature at 10 km altitude, 220 + or - 20 K; corrected height of the troposphere, 11 + or - 4 km; electron concentration in the lower ionospheric maximum, (7.5 + or - 2)x 10,000/cu cm electron concentration of the overall ionospheric maximum, (1.7 + or - 0.2). x 100,000/cu cm; altitude of the overall maximum, 138 + or - 4 km; depth of the ionosphere in the region 150-250 km, 35 + or - 10 km; and altitude of the normal lower maximum, 110 + or - 4 km. Author

N73-17866*# Kanner (Leo) Associates, Redwood City, Calif.
DUST STORMS ON MARS ACCORDING TO PHOTOMETRIC OBSERVATIONS TAKEN ON BOARD THE MARS-3 AUTOMATIC INTERPLANETARY STATION
V. I. Moroz, L. V. Ksanfomaliti, A. M. Kasatkin, and A. Z. Nadzhip Washington NASA Feb. 1973 10 p refs Transl. into ENGLISH from Kosm. Issled. (USSR), V. 10, no. 6, 1972 p 925-929
(Contract NASw-2481)
(NASA-TT-F-14818) Avail: NTIS HC $3.00 CSCL 03B

Dust particle size estimates and dust cloud origins during dust storms on Mars are presented based on photometric profiles made of the planet by the Mars 3 Automatic Interplanetary Station. A particle size within the range 0.5 to 1 microns is held to best account for the scattering measurements in six narrow central spectral regions. Dust particle size may be as large as 10 microns in different regions (of the same dust storm) and (in its) different phases of the same dust storm. Author

N73-17867# Joint Publications Research Service, Arlington, Va.
WHAT IS KNOWN TODAY ABOUT VENUS
M. Ya. Marov 26 Jan. 1973 23 p refs Transl. into ENGLISH from Priroda (Moscow), no. 10, 1972 p 9-20
(JPRS-58068) Avail: NTIS HC $3.25

Data on the planet Venus obtained by Soviet rockets is discussed. Author

N73-17868*# Kanner (Leo) Associates, Redwood City, Calif.
ANALOGUE OF POLYNUCLEOTIDE IN METEORITES
A. P. Vinogradov and G. P. Vdovykin Washington NASA Jan. 1973 6 p refs Transl. into ENGLISH from Dokl. Akad. Nauk SSSR, Astron. (Moscow), v. 206, no. 3, 1972 p 563-564
(Contract NASw-2481)
(NASA-TT-F-14683) Avail: NTIS HC $3.00 CSCL 03B

The carbonaceous Migei chrondrite was examined for the content in it of complex organic compounds, specifically polynucleotides. Flocculent particles of organic matter were found in the chondrite, its double helix structure being similar to DNA. To study amino acid content, specimens of the meteorite were treated with 2 N HCl and HF with heating and the residue hydrolyzed with 6 N HCl for 24 hours. Lysine, histadine, aspartic acid, glutamic acid, alanine, serine, valine, threonine, leucine, alpha-aminoisobutyric acid, beta-aminoidobutyric acid, beta-alanine and alpha-amino-n-butyric acid were found. Thus conditions for natural synthesis of the polynucleotide analogue existed in the protoplanetary gas-and-dust cloud, with solar radiation providing energy. Author

N73-17869*# Tulane Univ., New Orleans, La. Dept. of Geology.
SEDIMENTARY FEATURES ON THE SURFACE OF MARS AS SEEN FROM MARINER 6 AND 7 PHOTOGRAPHS
Ronald L. Parsley Washington NASA Mar. 1973 26 p refs
(Grant NGR-19-002-032)
(NASA-CR-2194) Avail: NTIS HC $3.00 CSCL 03B

Martian sedimentation is primarily aeolian with the principal source areas being the cratered highlands. Lighter albedo in areas of sedimentation may be due to minerals of smaller grain size and/or lighter specific gravity. Martian erosion sedimentation seems to be active as evidenced by removal and/or burial of ejecta mounds and ray ejecta patterns around fresh bowl shaped craters. It is suggested that at least some chaotic terrain may be formed by aeolian removal of material in areas of closely spaced faulting. Transitional areas between uplands and basins are sometimes muted by down slope winds. Author

N73-17870# Aerospace Corp., El Segundo, Calif. Electronics Research Lab.
A SEARCH FOR INTERSTELLAR C(14)O
Philip R. Schwartz (NRL, Washington, D.C.) and William J. Wilson 15 Nov. 1972 13 p
(Contract F04701-72-C-0073)
(AD-751912; TR-0073(9230-30)-3; SAMSO-TR-72-244) Avail: NTIS CSCL 03/2

A search for interstellar C(14)O was made at 105 871.11 MHz in seven galactic C12 sources with negative results. Author (GRA)

N73-17871# Aerospace Corp., El Segundo, Calif. Lab. Operations.
COORDINATED OPTICAL, INFRARED, AND RADIO OBSERVATIONS OF INTRADAY VARIABILITY OF 3C 120, BL LAC, AND OJ 287 Report for Nov. 1971 - Aug. 1972
30 Nov. 1972 33 p refs
(Contract F04701-72-C-0073)
(AD-752214; TR-0073(9230-20)-5; SAMSO-TR-72-269) Avail: NTIS CSCL 03/2

Simultaneous and near-simultaneous optical, infrared, and radio observations were made to search for intraday (time scale = 24h) variability of the radiation from 3C 120, BL Lac, and OJ 287, sources known to be active at both radio and optical wavelengths on time scales of days or longer. Optical interday (time scale = 24h) variability was found for all three sources. The finding of optical intraday variability for BL Lac verified earlier results. The 3.5-mm data strongly suggest intraday variations of OJ 287 with amplitudes as large as about 40%. The infrared data for OJ 287 show variability of about 25% on one night but show no correlation with the 3.5-mm data. Author (GRA)

N73-17872# Franklin Inst., Swarthmore, Pa. Bartol Research Foundation.
THEORETICAL STUDIES IN SUNSPOTS AND ASSOCIATED STRUCTURES Final Report, 26 Jan. 1970 - 26 Jul. 1972
Arne A. Wyller and Hong Sik Yun 4 Aug. 1972 51 p refs
(Contract F19628-70-C-0192; AF Proj. 8608)
(AD-752230; AFCRL-72-0466) Avail: NTIS CSCL 03/2

A numerical application to the extreme cases of high and low degree of ionization of the binary collision theory of Burgers (1960) and the multiple collision theory of Shkarofsky (1960) shows very good agreement in the values of the magnetic tensor components for solar electrical conductivity. It is pointed out that the inclusion of ion motions in Burger's theory favors its use in the future evaluation of the solar thermal conductivity tensor. The work of Ulmschneider (1970) on the effective thermal conductivity of partially ionized plasmas has been generalized to include the effects of magnetic fields. The contributions of electron ion and neutral heat flows have been evaluated within the framework of the binary collision theory of Burger's (1960). Author (GRA)

N73-17873# Owens Valley Radio Observatory, Pasadena, Calif.
APERTURE SYNTHESIS OBSERVATIONS OF MAFFEI 2 AT LAMBDA 21 cm
M. C. H. Wright and G. A. Seielstad 1972 21 p refs Prepared in cooperation with Natl. Radio Astron. Obs.
(Contract N00014-67-A-0094-0019; Grant NSF GP-3004)
(AD-752042; Rept-1972-11) Avail: NTIS CSCL 03/2

Maffei 2 is established as a rotating early-type spiral galaxy with a total mass exceeding 2.5 x 10 to the 9th power D(Mpc)

Solar mass units and a fractional hydrogen content less than 0.015 D. The continuum emission has nuclear, disk and halo components. Author (GRA)

N73-17874# Aerospace Corp., El Segundo, Calif. Space Physics Lab.
INTERPLANETARY SECTOR STRUCTURE AND THE HELIOMAGNETIC EQUATOR Report for Jan. 1971 - Jun. 1972
Michael Schulz 10 Nov. 1972 28 p refs
(Contract F04701-72-C-0073)
(AD-751909; TR-0073(3260-20)-11; SAMSO-TR-72-262)
Avail: NTIS CSCL 03/2

The magnetohydrodynamics of solar-wind flow lead logically to the formation of one warped annular neutral surface that extends from about twenty solar radii to the boundary of the heliosphere. The most likely asymptotic configuration for this neutral sheet intersects the heliomagnetic equatorial plane along four corotating arcs. The observer sees a reversal of magnetic polarity on each crossing of the neutral surface, and so interprets each reversal as the crossing of a sector boundary.
Author (GRA)

N73-17944* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NONEFFECT OF SOLAR ECLIPSES ON THE ATMOSPHERE
John S. Theon *In its* Significant Accomplishments in Sci., 1971 1972 p 47-51 (For availability see N73-17934 08-34)
CSCL 03C

N73-17953* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON ESTIMATING THE VENUS SPIN VECTOR
Peter D. Argentiero *In its* Significant Accomplishments in Sci., 1971 1972 p 88-99 refs (For availability see N73-17934 08-34)
CSCL 03C

N73-17954* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED SPECTRA OF CO2 IN THE ATMOSPHERES OF EARTH AND VENUS
William C. Maguire *In its* Significant Accomplishments in Sci., 1971 1972 p 100-103 (For availability see N73-17934 08-34)
CSCL 03B

N73-17955* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HOT CO ON MARS
Michael J. Mumma *In its* Significant Accomplishments in Sci., 1971 1972 p 104-107 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17961* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TYPE 3 SOLAR RADIO BURSTS
Larry G. Evans *In its* Significant Accomplishments in Sci., 1971 1972 p 131-134 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17965* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NEUTRON STAR AS A QUANTUM CRYSTAL
Vittorio M. Canuto *In its* Significant Accomplishments in Sci., 1971 1972 p 151-154 (For availability see N73-17934 08-34)
CSCL 03A

N73-17967* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPERNOVAE STUDIED WITH A GROUND LEVEL ATMOSPHERIC FLUORESCENCE
David L. Bertsch *In its* Significant Accomplishments in Sci., 1971 1972 p 160-164 refs (For availability see N73-17934 08-34)
CSCL 03A

N73-17970* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR MEDIUM MODEL
James C. Novaco *In its* Significant Accomplishments in Sci., 1971 1972 p 175-179 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17971* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SHAPE OF THE INTERSTELLAR REDDENING LAW
Michel Laget *In its* Significant Accomplishments in Sci., 1971 1972 p 180-184 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17972* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR CO IN THE ULTRAVIOLET SPECTRUM OF ZETA OPHIUCHI
Andrew M. Smith *In its* Significant Accomplishments in Sci., 1971 1972 p 185-189 (For availability see N73-17934 08-34)
CSCL 03B

N73-17973* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW INTENSITY H-BETA EMISSION FROM THE INTERSTELLAR MEDIUM
Ronald J. Reynolds *In its* Significant Accomplishments in Sci., 1971 1972 p 190-192 (For availability see N73-17934 08-34)
CSCL 03B

N73-17974* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
C-4 155-nm LINE IN BETA CEPHEI
David Fischel *In its* Significant Accomplishments in Sci., 1971 1972 p 193-196 (For availability see N73-17934 08-34)
CSCL 03B

N73-17975* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GIANT LOOPS: A NEW KIND OF NEBULA
Stephen P. Maran *In its* Significant Accomplishments in Sci., 1971 1972 p 197-200 refs (For availability see N73-17934 08-34)
CSCL 03B

N73-17976* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY DUST AND COMET ORBITS
Robert G. Roosen *In its* Significant Accomplishments in Sci., 1971 1972 p 201-203 (For availability see N73-17934 08-34)
CSCL 03B

N73-17977* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVIDENCE ON THE COMPOSITION AND MINERALOGY OF THE LUNAR HIGHLANDS
Charles C. Schnetzler *In its* Significant Accomplishments in Sci., 1971 1972 p 204-207 (For availability see N73-17934 08-34)
CSCL 03B

31 SPACE VEHICLES

Includes launch vehicles; manned space capsules; clustered and multistage rockets; satellites; sounding rockets and probes; and operating problems. For basic research see: 30 Space Sciences. For related information see also: 28 Propulsion Systems; and 32 Structural Mechanics.

N73-17875 Texas Univ., Austin.
A COMPARISON OF LOW-THRUST GUIDANCE TECHNIQUES Ph.D. Thesis
Jack Donald Hart 1971 178 p
Avail: Univ. Microfilms Order No. 72-15771

A comparison and analysis is made for several first and second order deterministic low-thrust guidance methods. The methods considered consist of several versions of a second order extremal field technique along with a first order technique known as lambda matrix control. The system model used for the comparison is a low-thrust vehicle performing a three-dimensional heliocentric Earth-Mars transfer. A reference trajectory is established and then each guidance technique is used to correct numerically introduced state errors. For the example considered, it is found that the capabilities of the first order guidance method are inadequate in decreasing terminal errors associated with the rendezvous phase of the mission. In addition, it is found that all of the second order guidance techniques considered are more successful in correcting for errors in the components of the vehicle position vector than in correcting for errors in the components of the velocity vector. Dissert. Abstr.

N73-17876 California Univ., Los Angeles.
THE ATTITUDE STABILITY OF SPINNING FLEXIBLE SPACECRAFT Ph.D. Thesis
Frank Joseph Barbera 1971 164 p
Avail: Univ. Microfilms Order No. 72-13588

The satellite is modeled as a rigid core having attached to it a flexible appendage idealized as a collection of particles interconnected by springs. Both Liapunov and Routh-Hurwitz stability procedures are used where in the former the Hamiltonian of the system is used as a testing function. Closed form stability criteria are generated for the first mode of a restricted appendage model lying in a plane containing the system center of mass and orthogonal to the spin axis. The effects of spin on flexible bodies are discussed by considering a very elementary particle model. The linearized equations of motion for a nonspinning flexible appendage are modified by spin; appendage mounting can greatly influence the natural frequencies of the structure. Engineering judgments on a very complex spacecraft, Skylab B are made. A simple rigid rotor directed along the spin axis, or a proportional controller representative of control moment gyros, can enhance stability. Dissert. Abstr.

N73-17877*# Grumman Aerospace Corp., Bethpage, N.Y.
ALTERNATE SPACE SHUTTLE CONCEPTS STUDY: DESIGN REQUIREMENTS AND PHASED PROGRAMS EVALUATION
1 Sep. 1971 263 p
(Contract NAS9-11160)
(NASA-CR-130747; MSC-03816) Avail: NTIS HC $15.25 CSCL 22B

A study to determine program and technical alternatives to the design of the space shuttle orbiter is described. The alternatives include a phased approach, involving orbiter development and operation with an expendable booster for an interim period, as well as design variations to the basic vehicle. The space shuttle orbiter configurations and predicted performance parameters are presented. Author

N73-17878*# Pennsylvania State Univ., University Park.
DYNAMICS AND CONTROL OF ESCAPE AND RESCUE FROM A TUMBLING SPACECRAFT Semiannual Progress Report, 1 Jun. - 30 Nov. 1972
Marshall H. Kaplan Dec. 1972 96 p refs
(Grant NGR-39-009-210)
(NASA-CR-130549; SAPR-3) Avail: NTIS HC $7.00 CSCL 22C

The results of 18 months of investigations are reported. A movable mass control system to convert the tumbling motion of a spacecraft into simple spin was studied along with the optimization techniques for generating displacement profiles for a tumbling asymmetrical body. Equations of motion are discussed for two asymmetrical vehicles with flexible beams and one spacecraft with flexible solar arrays. The characteristics which allow reasonable safety and reliability in bailout are also discussed. F.O.S.

N73-17879*# Goodyear Aerospace Corp., Akron, Ohio.
STUDY OF LARGE FLEXIBLE TUNNEL FOR SHUTTLE/PAYLOAD INTERFACE
22 Nov. 1972 79 p refs
(Contract NAS8-28951)
(NASA-CR-124073; GER-15834) Avail: NTIS HC $6.00 CSCL 22B

A theoretical and preliminary design study of a large flexible tunnel for use at the shuttle/payload interface is discussed. The theoretical study consisted of evaluating various design concepts and determining their adaptability to the tunnel requirements. The theoretical study culminated in the selection of one concept. The selected concept was documented with preliminary drawings of a full-scale ground test model. Supporting preliminary structural, thermal, micrometeoroid, material, and weight analyses were conducted. The specified tunnel requirements could be broadly grouped into two categories; environmental and performance. The environmental requirements were those ambient conditions and loads associated with ground, launch, space and reentry of the shuttle vehicle. Materials are presently available which will meet all these environmental requirements and can be designed into the structure to withstand the specified loads. Author

N73-17880*# Louisville Univ., Ky.
AN INVESTIGATION OF A MOVABLE MASS-ATTITUDE STABILIZATION SYSTEM FOR ARTIFICIAL-G SPACE Final Report
Dara W. Childs 1 Nov. 1972 75 p refs
(Contract NAS8-27952)
(NASA-CR-124081) Avail: NTIS HC $5.75 CSCL 22B

The application of a single movable mass to generate control torques for the attitude control of space vehicles is discussed. The feasibility of a movable mass control in stabilizing a cable-connected, artificial gravity configuration is proposed. A dynamic model for cable-connected configurations to account for the aggregate motion of the space station and relative torsional motion between the crew quarters and counter weight is developed. Author

N73-17881*# National Aeronautics and Space Administration, Washington, D.C.
STRUCTURAL DESIGN CRITERIA APPLICABLE TO A SPACE SHUTTLE Space Vehicle Design Criteria
Mar. 1972 99 p refs Revised
(NASA-SP-8057-REV) Avail: NTIS HC $3.00 CSCL 22B

The structural criteria are limited to general and mission-oriented criteria and are not configuration specific. Care was taken to ensure that the criteria will not restrict configuration development and will not establish the overall risk level. In some instances, margins of confidence are indicated, not only because experience shows them to be necessary but also because technology now permits quantitative values to be established. Author

N73-17882*# National Aeronautics and Space Administration, Washington, D.C.
THE INTERPLANETARY PIONEERS. VOLUME 2: SYSTEM DESIGN AND DEVELOPMENT
William R. Corliss 1972 312 p refs
(NASA-SP-279-Vol-2; LC-74-176234) Avail: NTIS MF $0.95; SOD HC $2.50 CSCL 22C

The Pioneer systems, subsystems, and ground support activities are described. Details are given on the launch trajectory and solar orbit plans, spacecraft design approach and evolution, scientific instrument, test and ground support equipment, Delta launch vehicle, tracking and communication, and data processing equipment. Pioneer specifications, and reliability and quality assurance are also included. N.E.N.

N73-17883*# Hamilton Standard, Windsor Locks, Conn.
SPACE SHUTTLE ENVIRONMENTAL AND THERMAL CONTROL LIFE SUPPORT SYSTEM COMPUTER PROGRAM
12 Oct. 1972 205 p
(Contract NAS9-12411)
(NASA-CR-128736; SP-01T72) Avail: NTIS HC $12.25 CSCL 22B

A computer program for the design and operation of the

space shuttle environmental and thermal control life support system is presented. The subjects discussed are: (1) basic optimization program, (2) off design performance, (3) radiator/evaporator expendable usage, (4) component weights, and (5) computer program operating procedures. Author

N73-17884*# LTV Aerospace Corp., Dallas, Tex.
EC/LSS THERMAL CONTROL SYSTEM STUDY FOR THE SPACE SHUTTLE Interim Report
H. R. Howell 6 Dec. 1972 292 p refs
(Contract NAS9-11166)
(NASA-CR-128735; T201-RP-20001) Avail: NTIS HC $16.75 CSCL 22B

The results of a parametric weight analysis of heat rejection systems for the space shuttle orbiter are presented. Integrating the suborbital heat rejection system with the overall heat rejection system design and the possible use of a common system for both on-orbit and suborbital operations require an overall system and parametric analyses applicable to all mission phases. The concept of equivalent weights, with weight penalties assigned for power, induced aircraft drag and radiator area is used to determine weight estimates for the following candidate systems: vapor cycle refrigeration, gas cycle refrigeration, radiators (space and atmospheric convectors), expendable heat sinks, and ram air. The orbiter power penalty, ram air penalty, and radiator weight penalty are analyzed. The vapor compression system and an expendable fluid system utilizing a multifluid spraying flash evaporator are selected as the two most promising systems. These are used for maximum on-orbit heat rejection in combination with or as a supplement to a space radiator. Author

N73-17885*# Kanner (Leo) Associates, Redwood City, Calif.
MAINTENANCE OF SPACE VEHICLES IN ORBIT BY MEANS OF REMOTELY CONTROLLED MANIPULATORS: A JOINT PROJECT BY ERNO, KYBERTRONIC, KLERA
H. Kleinwaechter and W. Wienss Washington NASA Feb. 1973 18 p refs Transl. into ENGLISH of "Wartung von Raumfahrzeugen im Orbit mit Hilfe von ferngesteuerten Manipulatoren: Ein Gemeinschaftsprojekt der erno, Kybertronic, Klera" Elektronik fuer Raumfahrt und Atomtechnik, Loerrach, West Germany, report 72-098, Oct. 1972 9 p Presented at 5th Ann. Meeting of the DGLR, Berlin, Oct. 1972
(Contract NASw-2481)
(NASA-TT-F-14804; Rept-72-098) Avail: NTIS HC $3.00 CSCL 22A

A sophisticated tool, Syntelmann, is used in outer space, the deep sea, and radioactive areas. It is controlled by the exoskeleton, attached to a man, and utilizes the concept of the slave following the master. Degrees of freedom are determined. Author

N73-17886*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
THE STAGING DYNAMICS OF A PROPOSED SPACE SHUTTLE CONFIGURATION M.S. Thesis - Houston Univ.
David A. Hamilton Oct. 1972 91 p refs
(NASA-TM-X-58098; MSC-07236) Avail: NTIS HC $6.75 CSCL 22B

A mathematical model was developed to simulate the staging dynamics of a proposed space shuttle configuration. Included in the mathematical model is the kinematics and dynamics of the staging mechanism, thrust forces and thrust vector control, rigid-body dynamics, and structural dynamics of both the booster and orbiter stages of the configuration. The mathematical model was incorporated into a computer program so that the staging maneuver could be simulated. Results of the simulations are presented. Author

N73-17887*# Techtran Corp., Glen Burnie, Md.
THREE STUDIES (FRENCH, BRITISH, GERMAN) CONCLUDE: 40 TO 50 CIVILIAN GEOSTATIONARY SATELLITES TO BE LAUNCHED BETWEEN 1980 AND 1990
P. Longereau Washington NASA 30 Jan. 1973 6 p Transl. into ENGLISH from Air Cosmos (France), no. 461, 16 Dec. 1972 p 38-48
(Contract NASw-2485)
(NASA-TT-F-14695) Avail: NTIS HC $3.00 CSCL 22B

A total of 41 to 53 geostationary satellites will be launched between 1980 and 1990 to serve telecommunications, television and navigation needs. Author

N73-17888*# National Aeronautics and Space Administration. John F. Kennedy Space Center, Cocoa Beach, Fla.
SPACE SHUTTLE RECOMMENDATIONS BASED ON AIRCRAFT MAINTENANCE EXPERIENCE
J. M. Spears and C. L. Fox (USAF) 15 May 1972 17 p
(NASA-TM-X-68646; KSC-TR-1161) Avail: NTIS HC $3.00 CSCL 22B

Space shuttle design recommendations based on aircraft maintenance experience are developed. The recommendations are specifically applied to the landing gear system, nondestructive inspection techniques, hydraulic system design, materials and processes, and program support. Author

N73-17889*# National Aeronautics and Space Administration. Lyndon B. Johnson Space Center, Houston, Tex.
SPACE SHUTTLE PERFORMANCE CAPABILITIES, REVISION 1
Gus R. Babb 16 May 1972 32 p refs
(NASA-TM-X-68859; MSC-04813-Rev-1; MSC-IN-71-FM-350) Avail: NTIS HC $3.75 CSCL 22B

The space shuttle performance capabilities and proposed space shuttle missions are discussed. The performance requirements of the space shuttle are described in terms of three reference missions. Mission requirements are defined by spacecraft or net payload weight and by orbital specifications or space destination. The predicted performance of various space shuttle configurations are analyzed. Author

N73-17890# Boston Coll., Chestnut Hill, Mass. Space Data Analysis Lab.
TECHNIQUES FOR DETERMINING THE VEHICLE ATTITUDE OF ROCKET AH7.886
Brian F. Sullivan, Marvin E. Stick, and Rene J. Marcou 30 Aug. 1972 42 p refs
(Contract F19628-70-C-0017)
(AD-751937; AFCRL-72-0575; SR-1) Avail: NTIS CSCL 19/7

Techniques for determining the attitude of the rocket axis for the vehicle AH7.886 are discussed. The attitude system consisted of a set of triaxial Schonstedt magnetometers, a Spectra-Physics sun sensor, serial number 2065-2, and an electronic multiplexer. Since no voltage greater than 3.24 volts was outputted by this multiplexer system, the sun angles could not be determined whenever the 3.24 volt saturation level was reached. To determine the attitude of the AH7.886 vehicle axis without available sun sensor data three different techniques were used, all yielding similar results. The first uses the rate of change of the magnetometers to solve for the attitude; the second simulates the attitude once an angle between the sun and rocket axis is known; and the third approach simulates the attitude after assuming sinusoidal motion for the elevation angle of the lateral magnetometer and full magnetic field readings by the lateral magnetometer for one-half a spin period. Author (GRA)

N73-17891# Lincoln Lab., Mass. Inst. of Tech., Lexington.
DESIGN OF A SOLAR EPHEMERIS SYNTHESIZER FOR LES-8/9
Sushanta Srivastava 12 Oct. 1972 44 p refs
(Contract F19628-73-C-0002; AF Proj. 649L)
(AD-752250; TN-1972-8; ESD-TR-72-239) Avail: NTIS CSCL 22/2

The various design considerations of a solar ephemeris synthesizer for the LES-8/9 stationkeeping system are discussed. Different approximations are used to reduce the amount of hardware required for building the synthesizer. The overall accuracy of the synthesizer is about 0.01 deg for orbits inclined up to 5.0 deg from the ecliptic plane. For orbits inclined at greater angles up to 10 deg, the short term accuracy is 0.01 deg/day and the long term accuracy is about 0.05 deg/year. A few ephemerides generated by the synthesizer are graphically illustrated. Author (GRA)

32 STRUCTURAL MECHANICS

Includes structural element design and weight analysis; fatigue; thermal stress; impact phenomena; vibration; flutter; inflatable structures; and structural tests. For related information see also: 17 Materials, Metallic; and 18 Materials, Nonmetallic.

N73-17892* National Aeronautics and Space Administration, Washington, D.C.
THE NASTRAN PROGRAMMER'S MANUAL
1972 2309 p
(NASA-SP-223(01)) Avail: Computer Software Management and Information Center, Barrows Hall, University of Georgia, Athens, Georgia 30601 $27.50 CSCL 20K

The computer programmer manual for NASTRAN is presented. The subjects discussed are: (1) NASTRAN programming fundamentals, (2) data block and table description, (3) subroutine descriptions, (4) module functional descriptions, (5) NASTRAN-operating systems interfaces, (6) modifications and additions to NASTRAN, and (7) NASTRAN support program. Author

N73-17893*# McDonnell-Douglas Corp., Huntington Beach, Calif.
ISOGRID DESIGN HANDBOOK
M. B. Harmon Dec. 1972 221 p
(Contract NAS8-28619)
(NASA-CR-124075; MDC-G4295) Avail: NTIS HC $13.25 CSCL 20K

The design of an optimum stiffening pattern for compressively loaded structures is discussed. The finalized concept consisted on triangulation of the stiffening members and was termed isogrid construction. The subjects discussed are: (1) basic isogrid theory, (2) isogrid characteristics and advantages, (3) analytical techniques, (4) tests, and (5) manufacturing processes. Author

N73-17894*# Alabama Univ., Huntsville. Research Inst.
PHENOMENA AFTER METEOROID PENETRATION OF A BUMPER PLATE Final Report
F. C. Todd 31 Jan. 1972 75 p
(Contract NAS8-26773)
(NASA-CR-124061) Avail: NTIS HC $5.75 CSCL 20K

The results are presented of a study to obtain a computer program for the penetration of a thin plate of aluminum by a sphere of rock. The study was divided into two projects. One project covers the initial impact, the crushing of the sphere of rock, the break up of the aluminum sheet, and the conversion of the sufficiently shock-compressed regions of rock and aluminum into a plasma. The other project considers the ejection of a cone of plasma with entrained particles from the impact zone, its expansion as it traverses a region of free space, and its impact on a stack of paper sheets. The ablation of fragments in penetrating the stack of paper sheets is also considered. Author

N73-17895*# Avco Corp., Lowell, Mass. Systems Div.
DEVELOPMENT OF LIGHTWEIGHT ALUMINUM COMPRESSION PANELS REINFORCED BY BORON-EPOXY INFILTRATED EXTRUSIONS
Paul A. Roy, John A. McElman, and Jim Henshaw Washington Jan. 1973 126 p refs
(Contract NAS1-9938)
(NASA-CR-2145) Avail: NTIS HC $3.00 CSCL 13B

Analytical and experimental studies were performed to evaluate the structural efficiencies afforded by the selective reinforcement of conventional aluminum compression panels with unidirectional boron epoxy composite materials. A unique approach for selective reinforcement was utilized called boron/epoxy infiltration. This technique uses extruded metal sections with preformed hollow voids into which unidirectional boron filaments are drawn and subsequently infiltrated with resin to form an integral part. Simplified analytical models were developed to investigate the behavior of stiffener webs with reinforced flanges. Theoretical results are presented demonstrating the effects of transverse shear, of the reinforcement, flange eccentricity and torsional stiffness in such construction. A series of 55 tests were conducted on boron-infiltrated rods and extruded structural sections. Author

N73-17896*# Boeing Commercial Airplane Co., Seattle, Wash.
CYCLIC DEBONDING OF ADHESIVE JOINTS: DATA REPORT
D. J. Hoffman and R. R. June Feb. 1973 120 p refs
(Contract NAS1-8858)
(NASA-CR-112219; D6-60136-6) Avail: NTIS HC $8.00 CSCL 20K

Static and fatigue loading tests of bonded lap joints were conducted. The specimens were designed to fail in the bondline and all fatigue tests included monitoring the crack growth to failure. Detailed crack length readings for 106 fatigue specimens are provided. Author

N73-17897*# Structures Research Associates, Laguna Beach, Calif.
COMPUTER ANALYSIS OF RING STIFFENED SHELLS OF REVOLUTION
Gerald A. Cohen Washington NASA Feb. 1973 80 p refs
(Contract NAS1-10091)
(NASA-CR-2085) Avail: NTIS HC $3.00 CSCL 20K

The equations and method of solution for a series of five compatible computer programs for structural analysis of axisymmetric shell structures are presented. These programs, designated as the SRA programs, apply to a common structural model but analyze different modes of structural response. They are: (1) linear asymmetric static response (SRA 100), (2) buckling of linearized asymmetric equilibrium states (SRA 101), (3) nonlinear axisymmetric static response (SRA 200), (4) buckling of nonlinear axisymmetric equilibrium states(SRA 201), and (5) vibrations about nonlinear axisymmetric equilibrium state (SRA 300). Author

N73-17898# Technischen Universitaet, Munich (West Germany).
CONTRIBUTION TO DESCRIBING MECHANICAL BEHAVIOR OF LINEAR VISCOELASTIC HIGH POLYMERS Ph.D. Thesis [BEITRAG ZUR BESCHREIBUNG DES MECHANISCHEN VERHALTENS VON LINEAR VISKOELASTISCHEN HOCHPOLYMEREN]
Winfried Wuttke 1972 137 p refs In GERMAN
Avail: NTIS HC $9.00

Simple linear differential equations with constant coefficients are used to analyze viscoelastic properties of high polymers. The equations are based on measured absolute values for dynamic elastic oscillations on rod shaped polyvinylchlorine samples. Differential equations of the fourth order present these dynamic characteristic qualities in workable form. Transl. by G.G.

N73-17899# British Steel Corp., London (England). Metallurgy Dept.
MEASUREMENT OF SUBCRITICAL FLAW GROWTH IN STRESS CORROSION, CYCLIC LOADING AND HIGH TEMPERATURE CREEP BY THE dc ELECTRICAL RESISTANCE TECHNIQUE
P. McIntyre and A. H. Priest 1971 18 p refs
(MG/54/71) Avail: NTIS HC $3.00

The dc electrical resistance technique has been applied to the measurement of subcritical flaw growth in fracture toughness specimens of different geometries under conditions of stress corrosion, cyclic loading and high temperature creep. The technique has been developed to give a linear potential change as a function of crack length, combined with maximum sensitivity. Comparisons made between this technique and the ultrasonic technique have enabled several sources of error to be identified and corrections to be made for these. Author

N73-17900*# Boeing Commercial Airplane Co., Seattle, Wash.
RESIDUAL STRESS ALLEVIATION OF AIRCRAFT METAL STRUCTURES REINFORCED WITH FILAMENTARY COMPOSITES Technical Report, Jul. 1971 - Mar. 1972
J. B. Kelly and R. R. June Jan. 1973 95 p refs
(Contract NAS1-8858)
(NASA-CR-112207; D6-60136-4) Avail: NTIS HC $6.75 CSCL 20K

Methods to eliminate or reduce residual stresses in aircraft metal structures reinforced by filamentary composites are discussed. Residual stress level reductions were achieved by modifying the manufacturing procedures used during adhesive bonding. The residual stress alleviation techniques involved various

forms of mechanical constraint which were applied to the components during bonding. Nine methods were evaluated, covering a wide range in complexity. All methods investigated during the program affected the residual stress level. In general, residual stresses were reduced by 70 percent or more from the stress level produced by conventional adhesive bonding procedures. Author

N73-17901# Ohio State Univ., Columbus. Dept. of Metallurgical Engineering.
EFFECT OF DEGREE OF SATURATION OF A TERMINAL SOLID SOLUTION ON SUSCEPTIBILITY TO PLASTIC INSTABILITY IN PURE SHEAR, PART 2 Annual Report
Amiya K. Chakrabarti and Joseph W. Spretnak Jul. 1972 56 p refs
(Contract AT(11-1)-2048)
(COO-2048-6-Pt-2) Avail: NTIS

The effect of the degree of saturation on the susceptibility to onset of plastic instability in pure shear is studied in the alpha-terminal solid solution in the Cu-Zn system. Fracture consistently occurred by strong instabilities in pure shear, both in tension and torsion in the vicinity of the alpha to alpha plus beta boundary. The saturated solid solutions show a maximum total ductility in tension, but exhibit a sharp maximum in the strength of the instability in torsion. Grain size has a significant effect on instability behavior. Serrated stress-strain curves were encountered in tensile testing (Portevin-LeChatelier effect). This effect in torsion testing was observed to be a result of transient instabilities in the direction of pure shear. Each event produced a flash of light in a narrow band in planes perpendicular to the axis of the torsion specimen. Author

N73-17902# Helsinki Univ. of Technology, Otaniemi (Finland).
ON THE STATE OF STRESS AND DISPLACEMENT OF CERTAIN SHELLS OF TRANSLATION
Martti M. Kaila 1972 87 p refs
(PB-212649; APS-CI-71) Avail: NTIS HC $3.00; Finnish Academy of Technical Sciences. Lonnrotinkatu 37,00/80 Helsinki 18 /Finland/: Fmk 8.00 CSCL 20K

The goal of the investigation is to produce relevant information about the state of stress and displacement of structures consisting of alternatingly elliptic and hyperbolic paraboloidal shells with a rectangular planform. The individual shells are assumed to be joined together smoothly, without intermediate supporting members. The number of shells, contained in the structures, is fixed at three. All shells are assumed to be shallow, thin, homogeneous, and to obey Hooke's law. The question, whether the structures under consideration are able to carry transversal load, is studied by deriving formal solutions both according to the membrane theory and according to the bending theory, and by examining the character and the meaningfulness of the solutions. Author (GRA)

N73-17903# Brown Univ., Providence, R.I. Engineering Materials Research Lab.
INCOMPRESSIBLE AND LINEARLY COMPRESSIBLE VISCOELASTIC CREEP AND RELAXATION
W. N. Findley and K. Onaran (Istanbull Technical Univ.) Oct. 1972 21 p refs
(Contract DAHC15-67-C-0217; Grant NSF GH-33631)
(AD-752067; EMRL-53; MRL-E-85) Avail: NTIS CSCL 20/11

It is shown that defining an incompressible material as one whose response to stressing or straining is insensitive to volumetric-type changes in strain or stress allows the derivation of incompressible forms for multiple integral representations, through the third order, which have only three kernel functions both in the creep formulation and the relaxation formulation. Earlier work had yielded four kernel functions in the relaxation and three in the creep formulation. Linearly compressible formulations are also discussed and compared with available creep data. Author (GRA)

N73-17904# Illinois Univ., Chicago. Dept. of Materials Engineering.
LONGITUDINAL IMPACT ON A ROD OF RATE-DEPENDENT MATERIAL Final Report, 1 Jul. 1971 - 31 Jan. 1972
William T. C. Li and Albert B. Schultz May 1972 33 p refs
(Contract F33615-71-C-1175; AF Proj. 7351)
(AD-751979; AFML-TR-72-62) Avail: NTIS CSCL 20/11

The problem of a semi-infinite road of rate-dependent material subjected to an axially applied load is considered and an arbitrary number of terms in series expressions are obtained for the velocity, stress and strain distributions in the rod. Several examples are given to illustrate the use of the method of series expansion in comparison with other numerical methods. Author (GRA)

N73-17905# Army Foreign Science and Technology Center, Charlottesville, Va.
THE THEORY OF PLASTICITY
V. V. Sokolovskii 18 Oct. 1972 676 p refs Transl. into ENGLISH from Russian report
(AD-752139; FSTC-HT-23-656-71) Avail: NTIS CSCL 20/11

This third and completely revised edition of the book includes the plastic twisting of the sections of a circular ring, the axial dislocation of a hardening mass between noncircular cylinders, the drawing of a plastic band through a convex dye, and a plastic plane equilibrium in conditions of general fluidity. The book shed a new light on results included in the first and second editions. The stress fields shown earlier in many two-dimensional problems have been supplemented by velocity fields constructed on the basis of a hypothesis of rigidly-plastic material, and many problems of the theory of plastic deformations have now been extended to the theory of plastic flow. Author (GRA)

N73-17906# Naval Ship Research and Development Center, Bethesda, Md.
A STRUCTURE-FLUID INTERACTION CAPABILITY FOR THE NASA STRUCTURAL ANALYSIS NASTRAN COMPUTER PROGRAM
Francis M. Henderson Aug. 1972 35 p refs
(ZR0140201; SF14532106)
(AD-752484; NSRDC-3962) Avail: NTIS CSCL 13/10

The report describes a method for incorporating the structure-fluid interaction effect into NASTRAN dynamic frequency response calculations for submerged structures. The interaction equation is derived by incorporating the effect of dynamic surface mobility into the equations which approximate the surface Helmholtz integral equation and by requiring velocity compatibility at the fluid-surface interface. The method is implemented through an interface between the computer program, XWAVE, for acoustic pressure calculations and NASTRAN. The method is demonstrated by calculating the shell-surface-fluid interaction pressures on a hollow sphere submerged in an infinite fluid and excited by a radial point harmonic forcing function. The surface pressure results are compared with values calculated using an analytic formula of M.C. Junger. Author (GRA)

N73-17907# Dayton Univ. Research Inst., Ohio.
DYNAMICS OF STIFFENED CYLINDRICAL SHELLS WITH SPATIALLY VARYING CURVATURE
T. J. McDaniel Wright-Patterson AFB, Ohio AFML Jul. 1972 57 p refs
(Contract F33615-70-C-1337; AF Proj. 7351)
(AD-752590; AFML-TR-72-134) Avail: NTIS CSCL 20/11

The report presents the results of a theoretical study of the effects of spatially varying curvature on the dynamics of cylindrical panels and stiffened cylindrical shell structures. Author (GRA)

33 THERMODYNAMICS AND COMBUSTION

Includes ablation, cooling, heating, heat transfer, thermal balance, and other thermal effects; and combustion theory. For related information see also: 12 Fluid Mechanics; and 27 Propellants.

N73-17908 Tulane Univ., New Orleans, La.
THE DETERMINATION OF ROCKET COMBUSTION CHAMBER TURBULENCE LEVELS FROM TURBULENT DIFFUSION DATA Ph.D. Thesis
Louis Oscar Smith 1971 130 p
Avail: Univ. Microfilms Order No. 72-14206

Turbulent diffusion measurements taken in a rocket combus-

tion chamber were analyzed to determine the Lagrangian correlation coefficient and the intensity of turbulence in the chamber. Helium concentration measurements were available from previous turbulent diffusion experiments. The profiles were integrated to obtain the variance or mean square dispersion distance caused by the turbulence. This quantity was determined as a function of the distance between the sampling station and the helium injector. The mean square dispersion distance was restricted by the presence of the chamber walls and had to be corrected to yield an equivalent free turbulence distance. The free turbulence mean square dispersion distance was analyzed by G. I. Taylor's theory of turbulent diffusion to determine the Lagrangian correlation coefficient and the turbulence intensity levels. Dissert. Abstr.

N73-17909 California Univ., San Diego.
THEORETICAL AND EXPERIMENTAL STUDIES ON LAMINAR HYBRID COMBUSTION Ph.D. Thesis
Lakshminarayanan Krishnamurthy 1972 243 p
Avail: Univ. Microfilms Order No. 72-14684

Analyses of laminar combustion phenomena in hybrid rockets are presented. A singular perturbation theory is developed for calculating the effects of finite-rate chemical kinetics on the regression rate of a semi-infinite flat plate of fuel placed in a gaseous oxidizer stream, thereby establishing an explicit pressure dependence for the regression rate. Laboratory experiments on the burning of polymethyl methacrylate (PMMA, Plexiglas) slabs at conditions closely approximating the flat plate boundary layer model are described. The perturbation analysis involves inherently a coordinate expansion problem, and it is treated as such. Techniques analogous to those applied in matched asymptotic parameter expansions are derived for this particular problem. Dissert. Abstr.

N73-17910 Princeton Univ., N.J.
THEORY OF FLAME FRONT PROPAGATION IN POROUS PROPELLANT CHARGES UNDER CONFINEMENT Ph.D. Thesis
Kenneth Kuan-Yun Kuo 1971 261 p
Avail: Univ. Microfilms Order No. 72-14153

It is shown in this research that ultra-high burning rates can be achieved in the combustion of porous propellant charges. A theoretical model is developed to describe the flow process, energy transfer, and flame front propagation in a packaged bed of granular propellant. A combustion-generated internal pressure gradient causes the hot product gas to penetrate the unburned region, thereby propagating the flame front. A divide forms automatically in the internal pressure profile as the wave progresses into the charge. A reverse flow is generated by the reverse pressure gradient on the rear side of the divide. Dissert. Abstr.

N73-17911*# Lockheed Missiles and Space Co., Huntsville, Ala. Research and Engineering Center.
THE DEVELOPMENT OF A RESIDENTIAL HEATING AND COOLING SYSTEM USING NASA DERIVED TECHNOLOGY
Mark J. ONeill, A. J. McDanal, and W. H. Sims Nov. 1972 99 p refs
(Contract NAS8-25986)
(NASA-CR-124063; LMSC/HREC-D306275; HREC-5986-3) Avail: NTIS HC $7.00 CSCL 20M

A study to determine the technical and economic feasibility of a solar-powered space heating, air-conditioning, and hot water heating system for residential applications is presented. The basic system utilizes a flat-plate solar collector to process incident solar radiation, a thermal energy storage system to store the collected energy for use during night and heavily overcast periods, and an absorption cycle heat pump for actually heating and cooling the residence. In addition, heat from the energy storage system is used to provide domestic hot water. The analyses of the three major components of the system (the solar collector, the energy storage system, and the heat pump package) are discussed and results are presented. The total system analysis is discussed in detail, including the technical performance of the solar-powered system and a cost comparison between the solar-powered system and a conventional system. The projected applicability of the system to different regions of the nation is described. Author

N73-17912*# National Bureau of Standards, Boulder, Colo. Cryogenics Div.
[MIXING AND HEAT TRANSFER CHARACTERISTICS OF SLUSH HYDROGEN]
Charles F. Sindt 10 Nov. 1972 58 p refs
(NBS Proj. 2750550; NASA Order W-13300)
(NASA-CR-130550; NBS-10762) Avail: NTIS HC $5.00 CSCL 20M

Methods of preparing suspensions of a hydrocarbon in slush hydrogen and heat transfer measurements to slush hydrogen are reported for possible nuclear rocket propellent applications. For individual titles, see N73-17913 through N73-17914.

N73-17913* National Bureau of Standards, Boulder, Colo.
PART A: HYDROCARBON SUSPENSION IN SLUSH HYDROGEN c06
Charles F. Sindt *In its* Mixing and Heat Transfer Characteristics of Slush Hydrogen 10 Nov. 1972 p 3-26 refs (For availability see N73-17912 08-33)
CSCL 07D

Methods of preparing suspensions of a hydrocarbon in slush hydrogen for nuclear fuel element corrosion inhibition in rocket engines were investigated. Suspensions were prepared using approximately 5000 ppm by mass of methane, ethane, or cyclopropane in slush hydrogen. The suspensions were stable in the slush, but the hydrocarbons settled out of the liquid melt. Author

N73-17914* National Bureau of Standards, Boulder, Colo.
PART B: HEAT TRANSFER TO SLUSH HYDROGEN
Charles F. Sindt *In its* Mixing and Heat Transfer Characteristics of Slush Hydrogen 10 Nov. 1972 p 27-50 refs (For availability see N73-17912 08-33)
CSCL 20M

Heat transfer to slush hydrogen was measured at one atmosphere and at triple-point pressure. The data were compared with those for heat transfer to liquid hydrogen, and to classical heat transfer correlations for nucleate boiling. The slush data fit convective heat transfer correlations quite well. In general, the data show that for a given heat flux, the temperature difference between the wall and the bulk liquid is not as highly influenced by pressure as predicted by the core correlation for nucleate boiling. Author

N73-17915*# Grumman Aerospace Corp., Bethpage, N.Y.
DESIGN, FABRICATION AND TESTING OF A THERMAL DIODE Final Report, 1 Jul. 1971 - 15 Nov. 1972
B. Swerdling and R. Kosson Nov. 1972 96 p refs
(Contract NAS2-6493)
(NASA-CR-114526) Avail: NTIS HC $7.00 CSCL 20M

Heat pipe diode types are discussed. The design, fabrication and test of a flight qualified diode for the Advanced Thermal Control Flight Experiment (ATFE) are described. The review covers the use of non-condensable gas, freezing, liquid trap, and liquid blockage techniques. Test data and parametric performance are presented for the liquid trap and liquid blockage techniques. The liquid blockage technique was selected for the ATFE diode on the basis of small reservoir size, low reverse mode heat transfer, and apparent rapid shut-off. Author

N73-17916*# Pratt and Whitney Aircraft, West Palm Beach, Fla. Research and Development Center.
EFFECT OF FUEL ZONING AND FUEL NOZZLE DESIGN ON POLLUTION EMISSIONS AT GROUND IDLE CONDITIONS FOR A DOUBLE-ANNULAR RAM-INDUCTION COMBUSTOR Final Report
T. R. Clements Feb. 1973 61 p refs
(Contract NAS3-11159)
(NASA-CR-121094; FR-5295) Avail: NTIS HC $5.25 CSCL 21B

An exhaust emission survey was conducted on a double-annular ram induction combustor at simulated ground idle conditions. The combustor was designed for a large augmented turbofan engine capable of sustained flight speeds up to Mach 3.0. The emission levels of total hydrocarbon (THC), carbon monoxide, carbon dioxide, and nitric oxide were measured. The effects of fuel zoning, fuel nozzle design, and operating conditions (inlet temperature and reference Mach number) on the level of these

emissions were determined. At an overall combustor fuel/air ratio of 0.007, fuel zoning reduced THC emissions by a factor of 5 to 1. The reduction in THC emissions is attributed to the increase in local fuel/air ratio provided by the fuel zoning. An alternative method of increasing fuel/air ratio would be to operate with larger-than-normal compressor overboard bleed; however, analysis on this method indicated an increase in idle fuel consumption of 20 percent. The use of air-atomizing nozzles reduced the THC emissions by 2 to 1. Author

N73-17917*# Jet Propulsion Lab., Calif. Inst. of Tech., Pasadena.
DISCONNECT UNIT Patent Application
Paul Alexander, Jr. and Arthur J. Murphy, Jr., inventors (to NASA) Filed 1 Feb. 1973 19 p
(Contract NAS7-100)
(NASA-Case-NPO-13172-1; US-Patent-Appl-SN-328795) Avail: NTIS HC $3.00 CSCL 19A

The squib actuated disconnect reported is characterized by an expandable collet axially extended from a first tension member for receiving in locking engagement a protuberance axially extended from a second tension member. A gas driven retainer of an annular configuration supports the collet in locking engagement with the protuberance. It adapts to be displaced in an axial direction in response to a firing of an associated squib thus accommodating a disengagement of the protuberance and the collet. NASA

N73-17918*# Scientific Translation Service, Santa Barbara, Calif.
MATERIAL PROBLEMS FOR HIGH TEMPERATURE HEAT PIPES
Claus A. Busse Washington NASA 7 Feb. 1973 20 p refs Transl. into ENGLISH from Forsch. Ingenieurw. (West Germany), v. 37, no. 2, 1971 p 38-43
(Contract NASw-2483)
(NASA-TT-F-14689) Avail: NTIS HC $3.00 CSCL 20M

Mechanisms involved in the corrosion of the heat pipes are discussed. One mechanism connected with the solubility of the wall material in the heat carrier is reponsible for mass transfer from the cooling zone into the heating zone. Another mechanism related to the accumulation of impurities in the heating zone leads to corrosion attack at the wall of that area. Approaches for avoiding heat zone corrosion are described. An operational heat pipe life of 10,000 hr in a temperature range from 1500 to 2000 deg is thought possible. Author

N73-17919*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
ANALYSIS OF SHAPE OF POROUS COOLED MEDIUM FOR AN IMPOSED SURFACE HEAT FLUX AND TEMPERATURE
Robert Siegel Washington Mar. 1973 36 p refs
(NASA-TN-D-7176; E-7104) Avail: NTIS HC $3.00 CSCL 20M

The surface of a porous cooled medium is to be maintained at a specified design temperature while being subjected to uniform heating by an external source. An analytical method is given for determining the shape of the medium surface that will satisfy these boundary conditions. The analysis accounts for temperature dependent variations of fluid density and viscosity and for temperature dependent matrix thermal conductivity. The energy equation is combined with Darcy's law in such a way that a potential can be defined that satisfies Laplace's equation. All of the heat-transfer and flow quantities are expressed in terms of this potential. The determination of the shape of the porous cooled region is thereby reduced to a free-boundary problem such as in inviscid free jet theory. Two illustrative examples are carried out: a porous leading edge with coolant supplied through a slot and a porous cooled duct with a rectangular outer boundary. Author

N73-17920*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
EFFECT OF TIMED SECONDARY-AIR INJECTION ON AUTOMOTIVE EMISSIONS
Kenneth P. Coffin Washington Mar. 1973 21 p refs
(NASA-TM-X-2737; E-7233) Avail: NTIS HC $3.00 CSCL 21B

A single cylinder of an automotive V-8 engine was fitted with an electronically timed system for the pulsed injection of secondary air. A straight-tube exhaust minimized any mixing other than that produced by secondary-air pulsing. The device was operated over a range of engine loads and speeds. Effects attributable to secondary-air pulsing were found, but emission levels were generally no better than using the engine's own injection system. Under nontypical fast-idle, no-load conditions, emission levels were reduced by roughly a factor of 2. Author

N73-17921*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
MEASUREMENT OF GASEOUS EMISSIONS FROM AN AFTERBURNING TURBOJET ENGINE AT SIMULATED ALTITUDE CONDITIONS
Larry A. Diehl Washington Mar. 1973 20 p refs
(NASA-TM-X-2726; E-7238) Avail: NTIS HC $3.00 CSCL 21B

Gaseous emissions from a J85-GE-13 turbojet engine were measured over a range of fuel-air ratios from idle to full afterburning and simulated altitudes from near sea-level to 12,800 meters (42,000 ft). Without afterburning, carbon monoxide and unburned hydrocarbon emissions were highest at idle and lowest at takeoff; oxides of nitrogen exhibited the reverse trend. With afterburning, carbon monoxide and unburned hydrocarbon emissions were greater than for military power. Carbon monoxide emissions were altitude dependent. Oxides of nitrogen emissions were less at minimum afterburning than at military power. For power levels above minimum afterburning, the oxides of nitrogen emissions were both power level and altitude dependent. Author

N73-17922# European Atomic Energy Community, Petten (Netherlands). Joint Nuclear Research Center.
ON THE MEASUREMENT OF STORED ENERGY AND SPECIFIC HEAT OF METALS AND ALLOYS USING A DIFFERENTIAL-SCANNING-CALORIMETER
E. Lang and G. VonBirgelen 1972 78 p refs In GERMAN
(EUR-4802-D) Avail: AEC Depository Libraries

A differential scanning calorimeter and its feasibility for studies of the physical properties of metals were examined. This calorimeter is a very useful tool for investigations of solid state reactions in metals and alloys where the energy released, e.g., stored energy introduced by quenching, cold work or irradiation as well as energies involved in phase transformations are of the order of 0.1 cal/g and more. It is further possible to perform an analysis of the kinetics of such reactions. The theory of a differential heat flow-calorimeter, the methods of calibration, determination of specific heat, the quantitative evaluation of DSC-diagrams and the determination of activation energies are discussed. Results are presented of calibration experiments, measurements of specific heat of Cu, Cu-Au, and Au-Ag alloys, and recovery spectra of cold-worked copper, alpha-brass, and Cu-25 Au alloys, investigations of phase transformations in the VO(x)-system and some examples for the determination of activation energies. Author (NSA)

N73-17923# Lille Univ. (France).
HEAT EXCHANGE PROCESSES IN EXCHANGER MATERIALS HIGH TEMPERATURE HEAT TRANSFER EQUIPMENT Ph.D. Thesis
David Yerouchalmi 1972 187 p refs In FRENCH
(FRNC-TH-231) Avail: AEC Depository Libraries

High-temperature heat exchange processes in a tubular metallic exchanger and in an exchanger which stores heat on a bed of moving pebbles were studied in the framework of a research program involving the 3 MW MHD energy conversion installation at Swierk (Poland). Refractory materials, resistant to alkaline corrosion and to grain growth, were developed as coating materials for both types of exchangers. Useful sintered materials were also developed. An original pebble bed-type exchanger heated by radiation and provided with distributors and valves, which retain their fluid tight properties at high temperatures, is proposed. This type of exchanger would have numerous advantages over those currently used. NSA

N73-17924*# Bell Aerosystems Co., Buffalo, N.Y.
RAIN EROSION CHARACTERISTICS OF THERMAL PROTECTION SYSTEM MATERIALS AT SUBSONIC VELOCITIES Summary Technical Report, 3 Apr. - 30 Jun.

1972
Norman E. Wahl Aug. 1972 119 p Sponsored in part by NASA
(Contract F33615-71-C-1219; AF Proj. 7340)
(NASA-CR-130541; AD-750793; AFML-TR-72-145) Avail: NTIS HC $8.00 CSCL 22/3

The relative rain erosion resistance of low density-thermal protection materials for the space shuttle were evaluated at velocities of 200, 350 and 410 miles per hour, angles of attack of 10, 20, 40 and 90 degrees and rainfall intensities of 1/4, 1/2 and 1 inch per hour on the AFML-Bell rotating arm rain erosion test apparatus. Author (GRA)

N73-17925# Army Electronics Command, Fort Monmouth, N.J. Power Sources Technical Area.
THERMODYNAMICS OF MOLTEN MIXTURES OF LITHIUM CHLORIDE-POTASSIUM CHLORIDE AT 640 C
Wishvendor K. Behl Oct. 1972 22 p refs
(DA Proj. 1T0-61102-A-34A)
(AD-752087; ECOM-4032) Avail: NTIS CSCL 07/4

The thermodynamics of lithium chloride-potassium chloride mixtures were studied over the concentration range x(LiCl) = 0.3 - 0.9 at 640C from the emf measurements on concentration cells with transference of the type: Cl2(g)-C/LiCl, KCl/LiCl/C-Cl2(g). A quartz spiral tube filled with alumina powder was used to establish the liquid junction between the two compartments. From a knowledge of transference numbers of the cations relative to the chloride ion, it was possible to determine the relative partial free energy of mixing and excess free energy of mixing of lithium chloride in the mixtures. The thermodynamic values for potassium chloride were obtained by using the Gibbs-Duhem equation. Both lithium chloride and potassium chloride show a slight negative deviation from ideality in their mixtures over the whole concentration range. Author (GRA)

N73-17926# Utah Univ., Salt Lake City. Dept. of Mechanical Engineering.
THE INFLUENCE OF MEAN FLOW ON ROCKET MOTOR COMBUSTION INSTABILITY. VOLUME 1: BASIC ANALYSIS, MEAN FLOW APPLICATION TO THE T-BURNER. VOLUME 2: EFFECT OF TURBULENCE ON ACOUSTIC WAVES IN A CAVITY. VOLUME 3: VORTEX GENERATED SOUND IN SOLID PROPELLANT Final Report
Gary A. Flandro, L. King Isaacson, David L. Boyd, and Phillip T. Linn Aug. 1972 355 p refs
(Contract F04611-71-C-0047)
(AD-752205; UTEC-DO-72-144-Vol-1; AFRPL-TR-72-103-Vol-1-2-3) Avail: NTIS CSCL 21/9

The report consists of two problems related to acoustic combustion instability in solid propellant rockets. In the first problem, coupled acoustic cavities with mass flux across a common boundary are studied. Since the propellant grain in a solid rocket motor may assume various configurations to meet specific performance criteria, physical models considering two or more wave-carrying systems coupled together so that acoustic motion of each is affected by the other are required in the study of acoustic instability in some motor designs. In the second problem, linear analyses employing both one-dimensional and three-dimensional flow models of the T-burner are studied to resolve which is the more appropriate representation of the growth of acoustic models yield an identical expression for the acoustic growth rate of dominant longitudinal modes in the T-burner if properly formulated. Author (GRA)

N73-17927# AeroChem Research Labs., Inc., Princeton, N.J.
FAST COMPUTER PROGRAM FOR NONEQUILIBRIUM ROCKET PLUME PREDICTIONS Final Report, 15 Jun. 1971 - 14 Jul. 1972
R. R. Mikatarian, C. J. Kau, and H. S. Pergament Aug. 1972 104 p refs
(Contract F04611-71-C-0064)
(AD-751984; AeroChem-TP-282; AFRPL-TR-72-94) Avail: NTIS CSCL 07/4

A fast computer program for predicting nonequilibrium rocket plume properties is described. The analytical model assumes parallel turbulent (or laminar) mixing between concentric chemically reacting streams and can also be used for studying chemical lasers and re-entry wakes. The effects on radar attenuation are also presented. The equations for free shear layer mixing with nonequilibrium chemistry are solved. The stability problems inherent in fully explicit finite difference schemes are shown to be eliminated. Computer run times for typical afterburning rocket plume calculations are shown to be decreased over the original (fully explicit) AeroChemaxisymmetric mixing with nonequilibrium chemistry program. Both the analysis and computer program write-up are presented, including a sample calculation and a FORTRAN listing. Author (GRA)

N73-17928# IIT Research Inst., Chicago, Ill.
INITIATION MECHANISMS OF SOLID ROCKET PROPELLANT DETONATION Interim Scientific Report, 1 Apr. 1971 - 31 Mar. 1972
Hyla A. Napadensky and Christian A. Kot Aug. 1972 24 p refs
(Contract F44620-71-C-0060; AF Proj. 9711; IITRI Proj. J6245)
(AD-752242; AFOSR-72-2027TR) Avail: NTIS CSCL 21/9

The mechanisms which may lead to detonation initiation in solid rocket propellants due to accidentally applied low amplitude stimuli are studied. In particular, the effects of low speed impact are studied. A two-dimensional Lagrangian computer code is used to study the detailed hydrodynamic (or elastic-plastic) and thermodynamic behavior of propellant materials under impact conditions. It was found that only moderate temperature increases are generated in unconfined impact of a cylindrical material billet upon a rigid surface. When a second boundary is introduced, i.e., the material is at rest on a rigid base and is impacted by a rigid plate, the temperatures developed under certain conditions exceed the values achieved in unconfined impact by more than a factor of two. Author (GRA)

N73-17929# Systems Science and Software, La Jolla, Calif.
MRVERA THE MULTIREGION VERA CODE
L. E. Bailey, S. Peyton, and M. C. Friedman Mar. 1972 52 p refs
(Contract DNA001-72-C-0016; DNA Proj. NWET-J24AAXY)
(AD-752066; SSS-R-72-1115; DNA-2951T) Avail: NTIS CSCL 20/13

A multiregion VERA code, MRVERA has been developed to solve radiation-hydrodynamic problems in complex geometries as a combination of independent one-dimensional planar, cylindrical, and spherical problems. Radiation and hydrodynamics in the individual regions are calculated with VERA. The subject matter is the mathematical and physical analysis and not the coding. The multiregion is the model assumes that the energy coupling between regions occurs principally as radiation through the void between the regions. This radiation transport is calculated using relativistic view factors to relate fluxes between regions moving in different directions. For radiation making multiple traversals through the void, the relativistic corrections are necessary to conserve energy. Author (GRA)

N73-17930# Naval Research Lab., Washington, D.C.
ANOMALOUS SPECIFIC HEAT OF DISORDERED SOLIDS
Herbert B. Rosenstock Nov. 1972 16 p refs
(NRL Proj. P03-07B; RR0220241)
(AD-752471; NRL-MR-2513) Avail: NTIS CSCL 20/12

Some years ago, a model was proposed to account for the observed excessive specific heat that glasses exhibit at low temperatures. Individual atoms trapped in a cavity and weakly bound to only one atom contribute to the specific heat, but not to the elastic properties, thus leading to a deviation from the normal relation between mechanical and thermodynamic properties. For quantitative calculations, the limiting model of a free particle in a cavity is used. Effects on the thermal conductivity, and relationship to other proposed theories, are discussed briefly. Author (GRA)

N73-17931# Western Michigan Univ., Kalamazoo. Dept. of Chemistry.
RATES AND MECHANISMS OF REACTIONS OF FLUORINE CONTAINING ROCKET PROPELLANTS Interim Report, 1 Sep. 1971 - 31 Aug. 1972
Thomas Houser Oct. 1972 15 p refs
(Grant AF-AFOSR-2160-72; AF Proj. 9750)
(AD-752564; AFOSR-72-2028TR) Avail: NTIS CSCL 21/2

The suitability of the mechanism proposed to describe the kinetic data for the pyrolysis of OF2 was discussed. In view of its limitations, an alternate mechanism was proposed, which is consistent with all of the most recent kinetic data. The study of the rate of the H2-OF2 reaction was continued in a magnesium reactor in an attempt to further reduce the surface effects. The indications are that the heterogeneous contributions to the rate are less than those found in monel or aluminum. A mechanism was proposed to explain the rate data obtained in the aluminum reactor. Up to the present time it has not been possible to obtain reproducible kinetic data for the oxygen inhibitied H2-N2F4 reaction. Author (GRA)

N73-17075* National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
CONTROL OF NITROGEN DIOXIDE IN STACK EMISSION BY REACTION WITH AMMONIA
Allen J. Metzler and Edward F. Stevenson *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 144-171 refs (For availability see N73-17064 08-04)
CSCL 21B

N73-17145 Minnesota Univ., Minneapolis. Dept. of Mechanical Engineering.
FLUOROCARBON COMBUSTION, FLUORINE SUPPORTED COMBUSTION KINETICS
Edward A. Fletcher *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 153-158 refs (For availability see N73-17129 08-06)

N73-17146 General Electric Co., Schenectady, N.Y. Corporate Research and Development.
BURNING OF POLYMERS
C. P. Fenimore and F. J. Martin *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 159-170 refs (For availability see N73-17129 08-06)

N73-17147 Naval Ordnance Lab., White Oak, Md.
PYROLYSIS AND COMBUSTION OF CELLULOSIC MATERIALS
Raymond Alger *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 171-183 refs (For availability see N73-17129 08-06)

N73-17148 Stevens Inst. of Tech., Hoboken, N.J. Combustion Lab.
THE SURFACE PYROLYSIS BOUNDARY CONDITION FOR THE COMBUSTION OF POLYMERS
R. F. McAlevy, III and W. S. Blazowski *In* NBS The Mech. of Pyrolysis, Oxidation, and Burning of Org. Mater. Jun. 1972 p 185-192 refs (For availability see N73-17129 08-06)
(Contract Nonr-263(48))

34 GENERAL

Includes information of a broad nature related to industrial applications and technology, and to basic research; defense aspects; information retrieval; management; law and related legal matters; and legislative hearings and documents.

N73-17932*+ National Aeronautics and Space Administration, Washington, D.C.
NASA PATENT ABSTRACTS BIBLIOGRAPHY: A CONTINUING BIBLIOGRAPHY. SECTION 2: INDEXES
Jul. 1972 375 p refs
(NASA-SP-7039(01)) Avail: NTIS HC $6.00 CSCL 14B

This issue contains entries for 2202 patent and patent application citations covering the period May 1969 through June 1972. The section contains indexes of subject, inventor, source, patent number, and accession number. Author

N73-17933*# Washington Univ., St. Louis, Mo.
VOCATIONAL TECHNICAL AND ADULT EDUCATION: STATUS, TRENDS AND ISSUES RELATED TO ELECTRONIC DELIVERY
Donna Rothenberg Jan. 1973 113 p refs
(Grant NGL-26-008-054)
(NASA-CR-130532; Memo-73/1) Avail: NTIS HC $7.75 CSCL 05I

Data are analyzed, and trends and issues are discussed to provide information useful to the systems designer who wishes to identify and assess the opportunities for large scale electronic delivery in vocational/technical and adult education. Issues connected with vocational/technical education are investigated, with emphasis on those issues in the current spotlight which are relevant to the possibilities of electronic delivery. The current role of media is examined in vocational/technical instruction. Author

N73-17934*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SIGNIFICANT ACCOMPLISHMENTS IN SCIENCES, 1971
Washington 1972 220 p refs Symp. held at Greenbelt, Md., 10 Nov. 1971 Original contains color illustrations
(NASA-SP-312) Avail: NTIS HC $3.00 CSCL 14B

Research papers are presented on various applications of remote sensing and satellite observation. The data are discussed from flights of many satellites, including Nimbus satellites, OGO satellites, ITOS, IMP, Mariner space probes, and Apollo spacecraft. For individual titles, see N73-17935 through N73-17978.

N73-17935* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOIL MOISTURE MEASUREMENTS WITH MICROWAVE RADIOMETERS c14
Thomas J. Schmugge *In its* Significant Accomplishments in Sci., 1971 1972 p 3-6 Original contains color illustrations (For availability see N73-17934 08-34)
CSCL 08M

Soil moisture measurements with microwave radiometers are used to study energy exchange of the air-soil interface. The Convair 990 was flown over agricultural test sites near Phoenix, Arizona to test remote sensors for soil moisture measurement. Onboard were six radiometers, ranging in wavelength from 21 cm to 8 mm. Linear regression results of microwave brightness temperature versus soil moisture content are shown. J.A.M.

N73-17936* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MINERAL EXPLORATION FROM HIGH ALTITUDE IMAGERY c13
Herbert W. Blodget *In its* Significant Accomplishments in Sci., 1971 1972 p 7-12 ref (For availability see N73-17934 08-34)
CSCL 08G

High altitude imagery of aircraft is compared with that of satellites. Observations were made over northwestern Saudi Arabia near the Red Sea. These observations were made for mineral exploration and for geological problem identification. J.A.M.

N73-17937* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ARCTIC ICE MEASUREMENTS WITH MICROWAVE RADIOMETERS c14
Per Gloersen *In its* Significant Accomplishments in Sci., 1971 1972 p 13-18 (For availability see N73-17934 08-34)
CSCL 08L

Arctic ice measurements with airborne microwave radiometers are compared to ground measurements. Ground measurements were made at approximately 74 deg N and 131 deg W, which is just inside the limits of the permanent polar ice pack off Banks Island. These measurements were taken in March 1971. J.A.M.

N73-17938* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A MULTISPECTRAL METHOD OF DETERMINING SEA SURFACE TEMPERATURES c14
William E. Shenk *In its* Significant Accomplishments in Sci., 1971 1972 p 19-23 (For availability see N73-17934 08-34)
CSCL 08C

Three channels of the Nimbus 2 medium resolution infrared

radiometer were used. One channel, in the absence of clouds, sensed the radiance from the sea surface and the intervening atmosphere, and the other two channels tested for cloud presence. J.A.M.

N73-17939* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MEASUREMENTS OF OCEAN COLOR c14
Warren A. Hovis *In its* Significant Accomplishments in Sci., 1971 1972 p 24-29 (For availability see N73-17934 08-34)
CSCL 08J

Phytoplankton density is determined by ocean color measurements. Phytoplankton is detected by remote sensing systems, because they contain chlorophyll. Chlorophyll has two strong absorption bands in the visible spectrum. The algae Chlorella shows the strongest absorptions at 450 and 675 nm. The measured spectrum of ocean color at low and high altitudes is shown. J.A.M.

N73-17940* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ATMOSPHERIC WIND FIELDS DERIVED FROM NIMBUS OZONE MEASUREMENTS c14
Cuddapah Prabhakara *In its* Significant Accomplishments in Sci., 1971 1972 p 30-33 (For availability see N73-17934 08-34)
CSCL 04A

Infrared interferometer spectrometer and backscatter ultraviolet spectrometer onboard the Nimbus 4 satellite were used to measure ozone content in the atmosphere. The global ozone measurements were used to trace the circulation in the upper troposphere. J.A.M.

N73-17941* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STRATOSPHERIC OZONE c13
Richard W. Stewart *In its* Significant Accomplishments in Sci., 1971 1972 p 34-36 ref (For availability see N73-17934 08-34)
CSCL 04A

Photochemical and transport processes in the earth's stratosphere are studied. The effects of trace constituents such as water vapor and nitrogen oxides on stratospheric ozone distribution are emphasized. J.A.M.

N73-17942* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
VERTICAL MOTIONS INFERRED FROM SATELLITE RADIOMETRY c14
Vincent V. Salomonson *In its* Significant Accomplishments in Sci., 1971 1972 p 37-41 (For availability see N73-17934 08-34)
CSCL 04B

Medium and high resolution radiometer measurements from Nimbus satellites on water vapor absorption regions in the troposphere are discussed. Imagery obtained from temperature-humidity infrared radiometer is shown. Quantitative verification was provided that shows radiometric water vapor observations are reflecting dynamic processes in the middle and upper troposphere and that these observations can be used to delineate areas of vertical motion. J.A.M.

N73-17943* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STUDIES WITH SATELLITE RADIOMETER DATA c14
Milton Halem *In its* Significant Accomplishments in Sci., 1971 1972 p 42-46 (For availability see N73-17934 08-34)
CSCL 04B

Both ITOS D and Nimbus E radiometer data are studied, including the vertical temperature profile. Methods were developed for the four dimensional assimilation of satellite radiometer data. Imbedded grids for high resolution short range forecast experiments utilizing dense data from geostationary sounders are briefly mentioned. J.A.M.

N73-17944* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NONEFFECT OF SOLAR ECLIPSES ON THE ATMOSPHERE c30
John S. Theon *In its* Significant Accomplishments in Sci., 1971 1972 p 47-51 (For availability see N73-17934 08-34)
CSCL 03C

Solar eclipse effects on the atmosphere were measured by three pitot probe rocket soundings. These measurements corresponded to 40, 80, and 100 percent totality of the eclipse. Temperature profiles obtained during the eclipse are plotted as a function of time. J.A.M.

N73-17945* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE GLOBAL HYDROGEN REPORT c13
Henry C. Brinton *In its* Significant Accomplishments in Sci., 1971 1972 p 52-57 refs (For availability see N73-17934 08-34)
CSCL 04A

Explorer 32 data on atmospheric hydrogen distribution are discussed. Escape, diffusion, and lateral flow of hydrogen are described during night and day through the exosphere, thermosphere, and mesosphere. Temporal variations, diurnal variations, and solar activity related to hydrogen distribution are also considered. J.A.M.

N73-17946* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC CONTROL OF THE HIGH LATITUDE THERMOSPHERE c13
Alan E. Hedin *In its* Significant Accomplishments in Sci., 1971 1972 p 58-61 (For availability see N73-17934 08-34)
CSCL 04A

The thermospheric composition and density were measured by a neutral mass spectrometer onboard OGO 6 satellite. The observations were made during a quiet magnetic period in late August and early September 1969 when the satellite perigee was near the South Pole. Gas densities at 430 km altitude and contours of constant N2 and He densities were plotted. J.A.M.

N73-17947* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
A NEW VIEW OF THE RING CURRENT c13
Masahisa Sugiura *In its* Significant Accomplishments in Sci., 1971 1972 p 62-66 refs (For availability see N73-17934 08-34)
CSCL 08N

The OGO 3 and 5 observations provided reliable magnetic field data on the inner magnetosphere, including the intensity and distribution of the quiettime ring current. The field energy density associated with the minimum Delta B (about -40 nT) is found to be greater than the plasma energy density estimated from the available thermal plasma observations by a factor of 10 or more. J.A.M.

N73-17948* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE MAGNETOSPHERIC PLASMA TAIL c13
Joseph M. Grebowsky *In its* Significant Accomplishments in Sci., 1971 1972 p 67-70 (For availability see N73-17934 08-34)
CSCL 14N

Thermal proton density measurements by the RF ion mass spectrometer on the low altitude, polar orbiting, satellite OGO 4 were compared on five consecutive nightside passes during the early recovery stage of an intense storm occurring in September 1967. The observations showed the existence of an elongated plasma tail during the recovery phase of the storm. J.A.M.

N73-17949* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
MAGNETIC FIELD OBSERVATIONS OF THE DAYSIDE POLAR CUSP c13
Donald H. Fairfield *In its* Significant Accomplishments in Sci., 1971 1972 p 71-74 ref (For availability see N73-17934 08-34)
CSCL 14N

Particle entry into the magnetosphere was measured by IMP 5 spacecraft, making systematic measurements of the polar or dayside cusp. The magnetic field measurements in the polar cusp are found to have low magnitudes and large fluctuations.

The transition between the magnetosheath and the cusp portion of the magnetosphere is not characterized by a well defined magnetopause as at low latitudes. J.A.M.

N73-17950* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RECENT PROBE MEASUREMENTS OF dc ELECTRIC FIELDS FROM IMP 1 c13
Thomas L. Aggson *In its* Significant Accomplishments in Sci., 1971 1972 p 75-78 (For availability see N73-17934 08-34)
CSCL 14N

Electric field observations from IMP 1 are discussed: the long stem antennas of IMP 1 are described as double floating probes. The order of 1 mV/m in the solar wind with about a 40 percent jump at the bow shock was observed. As the plasma becomes magnetized and the electric field is built up to several millivolts per meter in the magnetosheath, there is a large discontinuity at the magnetopause. J.A.M.

N73-17951* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR WIND MAINTENANCE OF THE NIGHTTIME VENUS IONOSPHERE c29
Richard E. Hartle *In its* Significant Accomplishments in Sci., 1971 1972 p 79-82 ref (For availability see N73-17934 08-34)
CSCL 03B

A possible ionization source (solar wind) which can reproduce the features of the nighttime Venus ionosphere is proposed. The electron density profiles inferred from a two frequency occultation experiment on Mariner 5 are considered. Solar wind interaction model and nightside ionosphere model are presented. J.A.M.

N73-17952* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ION CLUSTERS AND THE VENUS ULTRAVIOLET HAZE LAYER c29
Arthur C. Aikin *In its* Significant Accomplishments in Sci., 1971 1972 p 83-87 refs (For availability see N73-17934 08-34)
CSCL 03B

The daytime ionospheric composition of Venus was observed between 100 and 500 km altitude. Clustering of neutrals to ions was found to be dependent on the polarizability of the neutral molecule and ion mass. J.A.M.

N73-17953* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
ON ESTIMATING THE VENUS SPIN VECTOR c30
Peter D. Argentiero *In its* Significant Accomplishments in Sci., 1971 1972 p 88-99 refs (For availability see N73-17934 08-34)
CSCL 03C

The Venus spin vector and probe position estimates were improved. The ensemble equations associated with weighted least squares were duplicated. The weighting matrix was assumed to be the inverse of the covariance matrix of the noise. J.A.M.

N73-17954* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INFRARED SPECTRA OF CO2 IN THE ATMOSPHERES OF EARTH AND VENUS c30
William C. Maguire *In its* Significant Accomplishments in Sci., 1971 1972 p 100-103 (For availability see N73-17934 08-34)
CSCL 03B

Flight and ground-based infrared interferometer spectrophotometers were used to measure infrared spectra that can be used for temperature inversion. The emission and absorption of radiation within a planetary atmosphere which is dependent on temperature, pressure, and composition of the atmosphere is discussed. Earth and Venus radiance spectra are determined by theory from data gleaned from Nimbus 3 and observatory measurements. J.A.M.

N73-17955* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
HOT CO ON MARS c30
Michael J. Mumma *In its* Significant Accomplishments in Sci., 1971 1972 p 104-107 refs (For availability see N73-17934 08-34)
CSCL 03B

Hot CO on Mars was measured by an ultraviolet scanning spectrometer onboard Mariner 6 and 7. Emission profiles of bands of the fourth positive group of CO are presented. It is postulated that high effective rotational temperatures will result in reduced self-absorption of the CO fourth positive bands on Mars. J.A.M.

N73-17956* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THEORETICAL LIMITS ON JOVIAN RADIO BELTS c29
Fritz M. Newbauer *In its* Significant Accomplishments in Sci., 1971 1972 p 108-110 ref (For availability see N73-17934 08-34)
CSCL 03B

Jovian radiation belt effects on proposed field and particle studies are discussed. The environment of Jupiter showing the instability region in the radiation belts is described, including the positions of the relativistic electron belts. J.A.M.

N73-17957* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
RESULTS FROM THE GSFC OSO 7 SPECTROHELIOGRAM c14
Werner M. Neupert *In its* Significant Accomplishments in Sci., 1971 1972 p 111-116 (For availability see N73-17934 08-34)
CSCL 03B

Maps of an active region of the sun and a solar flare observed with the OSO-7 spectroheliograph on 3 Oct. 1971 are presented. The radiations recorded are H-alpha and soft X-rays. D.L.G.

N73-17958* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TRANSPORT OF COSMIC RAYS IN THE SOLAR CORONA c29
Kenneth H. Schatten *In its* Significant Accomplishments in Sci., 1971 1972 p 117-121 refs (For availability see N73-17934 08-34)
CSCL 03B

It is pointed out that solar cosmic rays can gain access to the interplanetary magnetic field near Earth from flares located almost anywhere on the Sun. A method is suggested by which these energetic particles can diffuse in solar longitude. The method consists of particle motion occurring along current sheets separating discontinuous field structures in the corona. These sheets can serve as pathways along which energetic particles drift at nearly their propagation speed. D.L.G.

N73-17959* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SOLAR PARTICLE COMPOSITION MEASUREMENTS c29
Donald V. Reames *In its* Significant Accomplishments in Sci., 1971 1972 p 122-125 ref (For availability see N73-17934 08-34)
CSCL 03B

The results are presented of studies on the composition of solar particle events, the relative abundance of different elements, using nuclear emulsion detectors flown on sounding rockets. The particle measurements appear to provide a direct measure of solar abundances themselves in the intense events. The solar cosmic ray results are compared with photospheric and coronal abundances for the elements and the agreement is reasonably good. D.L.G.

N73-17960* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE CHARGE SPECTRA OF SOLAR COSMIC RAYS c29
Tycho T. VonRosenvinge *In its* Significant Accomplishments in Sci., 1971 1972 p 126-130 ref (For availability see N73-17934 08-34)
CSCL 03B

A different approach to measuring charge spectra of solar cosmic rays which was implimented on the IMP 6 satellite is discussed. The approach involves a telescope system which preferentially selects rare events above charge 2 and gives them top priority for telemetry readout. This system has effectively

increased the number of nuclei observed above charge 2 by a factor of several hundred. D.L.G.

N73-17961* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
TYPE 3 SOLAR RADIO BURSTS c30
Larry G. Evans *In its* Significant Accomplishments in Sci., 1971 1972 p 131-134 refs (For availability see N73-17934 08-34)
CSCL 03B

The validity of numerous theories on the generation process of type 3 solar radio bursts was examined using low frequency satellite observations. A direct comparison of the different theories was possible by having available independent measurements by satellite electron detectors in the same region of the interplanetary media where the radio emission is being generated. The results show, on the basis of this comparison, the general inadequacies of current type 3 burst theories and indicate the need for formulating a new theory that is consistent with the low frequency observations. D.L.G.

N73-17962* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
QUIETTIME ELECTRON INCREASES c29
Leonard A. Fisk *In its* Significant Accomplishments in Sci., 1971 1972 p 135-138 ref (For availability see N73-17934 08-34)
CSCL 03B

A cosmic ray phenomenon is discussed which has been detected from monitoring the behavior of interplanetary electrons by the IMP spacecraft. Daily averages of the 3 to 12 MeV electron intensity from the IMP observations were plotted for the period from 1965 through 1968. Quiettime electron increases were found to occur in anticoincidence with increases in the flux of low energy solar protons. It was also found that the quiettime increases and the galactic background both have the same spectral index of about 2. The significance of these findings is discussed and a possible explanation for this phenomenon is suggested. D.L.G.

N73-17963* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
COSMIC RAY CHARGE AND ENERGY SPECTRA ABOVE 10 GeV c29
Johnathan F. Ormes *In its* Significant Accomplishments in Sci., 1971 1972 p 139-145 refs (For availability see N73-17934 08-34)
CSCL 03B

A program to study the composition and energy spectra of cosmic rays above 1.6 nJ is reported. The results are presented of a balloon flight made in Nov. of 1970, and the measuring instrument employed is described. The instrument was designed to identify cosmic ray electrons, protons, and nuclei up through iron and to measure their energies. D.L.G.

N73-17964* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SURVIVAL OF HEAVY NUCLEI IN COSMIC RAY SOURCE ENVIRONMENTS c29
V. K. Balasubrahmanyan *In its* Significant Accomplishments in Sci., 1971 1972 p 146-150 (For availability see N73-17934 08-34)
CSCL 03B

The results are discussed that were obtained from the Goddard balloon spectrometer experiment to study the composition and energy distribution of high energy cosmic rays. The significant findings indicate that: (1) On a total energy scale, protons constitute only a minor proportion of the cosmic rays. They account for only 20 percent; the rest of the cosmic rays are complex nuclei. (2) All the nuclei have the same power low spectrum in total energy and so the composition appears to be independent of energy. D.L.G.

N73-17965* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE NEUTRON STAR AS A QUANTUM CRYSTAL c30
Vittorio M. Canuto *In its* Significant Accomplishments in Sci., 1971 1972 p 151-154 (For availability see N73-17934 08-34)
CSCL 03A

The results are presented of a study to calculate the equation of state for the interior of neutron stars. The energy was computed based on a belief that in order to minimize the energy the particles would arrange themselves in a very orderly system, as a crystal, rather than being randomly distributed, as in a gas. The results appeared to confirm this belief and it was concluded that previous computations of the neutron star mass, based on a gaseous arrangement of particles, are invalid. D.L.G.

N73-17966* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPRATHERMAL PROTON BREMSSTRAHLUNG c29
Frank C. Jones *In its* Significant Accomplishments in Sci., 1971 1972 p 155-159 refs (For availability see N73-17934 08-34)
CSCL 03B

The process is examined in which a suprathermal proton strikes a relatively motionless electron in a background plasma and causes the electron to radiate. Major emphasis is placed on determining the differential cross section as a function of energy of the emitted photon. A unique method is described for calculation of the cross section which is believed to be considerably superior to the conventional one in the case of relativistic collisions. D.L.G.

N73-17967* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
SUPERNOVAE STUDIED WITH A GROUND LEVEL ATMOSPHERIC FLUORESCENCE c30
David L. Bertsch *In its* Significant Accomplishments in Sci., 1971 1972 p 160-164 refs (For availability see N73-17934 08-34)
CSCL 03A

A monitoring experiment which was begun in late 1968 to search for proton bursts of extraterrestrial origin is described and the results obtained to date are summarized. The method of detection employs ground-based photomultiplier tubes which are sensitive to the secondary fluorescence light that would be produced when the primary pulse is absorbed in the atmosphere. D.L.G.

N73-17968* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
DIFFUSE X-RAYS FROM THE GALACTIC DISK c29
Peter J. Serlemitsos *In its* Significant Accomplishments in Sci., 1971 1972 p 165-169 (For availability see N73-17934 08-34)
CSCL 03B

An anisotropic feature is reported of the diffuse hard X-ray background that tracks the concentration of interstellar hydrogen in the plane of the galaxy. Measurements of possible galactic effects on the X-ray sky were carried out on 9 Aug. 1971, using two multianode multilayer gas proportional counters onboard Aerobee 170 flight 13.08. The data obtained from the detectors are presented and calculations based on these data are discussed. The anisotropic feature supports a model of galactic X-ray emission by subrelativistic cosmic rays via a bremsstrahlung process. D.L.G.

N73-17969* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
STELLAR X-RAY TEMPORAL VARIATIONS c29
Stephen S. Holt *In its* Significant Accomplishments in Sci., 1971 1972 p 170-174 (For availability see N73-17934 08-34)
CSCL 03B

Temporal studies on Sco X-1 and Cyg X-1 are reported. The results of the studies are discussed with emphasis placed on the question of whether or not all X-ray sources are driven by pulsars. In the case of Sco X-1, observational parameters indicate a lifetime of less than 100 ms and therefore the presence of a pulsar. Although no pulsar could be found by an examination of rocket data, two theoretical models were proposed based on the premise that a pulsar can be hidden underneath a thick plasma cloud, and the X-ray emission would come secondarily from the pulsar energy incident from the cloud from underneath. Subsequent studies of Cyg X-1 failed to confirm this theory. A lifetime of 290 ms was calculated and a pseudoperiodic behavior

was indicated which would not be expected from a pulsar. D.L.G.

N73-17970* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR MEDIUM MODEL c30
James C. Novaco *In its* Significant Accomplishments in Sci., 1971 1972 p 175-179 refs (For availability see N73-17934 08-34)
CSCL 03B

A model was developed of the ionized part of the interstellar medium based on the low frequency observations by the RAE satellite with a background of nonthermal radiation. The model has a two-dimensional geometry, the plane of the model being perpendicular to the galactic disk and passing through the center and anti-center. The model supports the concept of a thermal gradient away from the galactic plane. D.L.G.

N73-17971* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE SHAPE OF THE INTERSTELLAR REDDENING LAW c30
Michel Laget *In its* Significant Accomplishments in Sci., 1971 1972 p 180-184 refs (For availability see N73-17934 08-34)
CSCL 03B

A study was conducted to find the wavelength dependence of the reddening law and to determine if the law is the same for all stars. The opportunity to derive the interstellar reddening and to consider a statistical approach was provided by observations from OAO 2. Twelve stars of spectral type BO were observed with an onboard set of broadband photometers at 10 effective wavelengths. The results of the study are presented and their significance is discussed. D.L.G.

N73-17972* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERSTELLAR CO IN THE ULTRAVIOLET SPECTRUM OF ZETA OPHIUCHI c30
Andrew M. Smith *In its* Significant Accomplishments in Sci., 1971 1972 p 185-189 (For availability see N73-17934 08-34)
CSCL 03B

Using optical methods in the vacuum ultraviolet, CO was observed in the spectrum of Zeta Ophiuchi. An analysis of this observation indicates that: (1) Interstellar CO is probably located in one or a small number of clouds intercepted by the line of sight. (2) The column density and turbulence parameters are 1.8 x 10 to the 15th power/cm sq and 1.5 km/s, respectively, and are consistent with observations of other interstellar lines. (3) The results are consistent with viewing the interstellar CO molecules as being in thermodynamic equilibrium with a 2.7 K fossil blackbody radiation field. D.L.G.

N73-17973* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
LOW INTENSITY H-BETA EMISSION FROM THE INTERSTELLAR MEDIUM c30
Ronald J. Reynolds *In its* Significant Accomplishments in Sci., 1971 1972 p 190-192 (For availability see N73-17934 08-34)
CSCL 03B

A search for the H-beta line resulting from the very faint hydrogen recombination radiations was made using a spectrometer at the Coude focus of Goddard's 36-in. telescope. The search was confined to directions near pulsars because of the additional information provided by the dispersion measure which gives the total number of electrons along the line of sight to the pulsar. Of the four directions in which observations were made, an emission line appears to be present in at least two and possibly three directions. The conclusions drawn from the data obtained are discussed. D.L.G.

N73-17974* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
C-4 155-nm LINE IN BETA CEPHEI c30
David Fischel *In its* Significant Accomplishments in Sci., 1971 1972 p 193-196 (For availability see N73-17934 08-34)
CSCL 03B

Ultraviolet observations were taken using OAO 2 to investigate the relationship between the visual and ultraviolet variations in the C-4 155-nm line in Beta Cephei. Based on the data obtained, two possible models of Beta Cephei are proposed. One model has a nearly circular orbit with a period of 12 days such that the front and back tidal bulges are seen alternately by the observer, one every 6 days. The other model has a very elliptical orbit whose period is of the order of 6 days; the tidal bulge comes and goes so that one sees the bulge every 6 days. D.L.G.

N73-17975* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GIANT LOOPS: A NEW KIND OF NEBULA c30
Stephen P. Maran *In its* Significant Accomplishments in Sci., 1971 1972 p 197-200 refs (For availability see N73-17934 08-34)
CSCL 03B

Four enormous, loop-shaped features that were found in ground-based surveys of the low frequency galactic radio emission are discussed. With diameters of 40 to 116 deg, they include the Cetus Arc and the North Polar Spur. Two leading theories for the giant loops have emerged. The first ascribes the loops to synchrotron radiation by cosmic ray electrons that are spiraling in the helical pattern of the galactic magnetic field near the sun. The other theory suggests that they are very large, old, supernova remnants. Some of the many objections to these theories are discussed. An alternative theory is proposed which suggests that the loops are ancient fossil Stromgren spheres. While not conclusive, the proposed theory appears to overcome the major objections to the two other theories. D.L.G.

N73-17976* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
INTERPLANETARY DUST AND COMET ORBITS c30
Robert G. Roosen *In its* Significant Accomplishments in Sci., 1971 1972 p 201-203 (For availability see N73-17934 08-34)
CSCL 03B

Data obtained from extremely sensitive micrometeoroid detectors flown on Pioneer 8 and 9 are used to discount the validity of unreasonably high particle flux measurements from earlier microphone observations. The microphone experiments had experienced periods of dust storms in which their count rates increased by as much as a factor of 1000 over their average background rate. The only comprehensive explanation of the dust storms was a theory that suggested that the dust events were associated with periodic comets. The pioneer observations are completely at odds with the early microphone measurements and no comet associated dust storms were detected. D.L.G.

N73-17977* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
EVIDENCE ON THE COMPOSITION AND MINERALOGY OF THE LUNAR HIGHLANDS c30
Charles C. Schnetzler *In its* Significant Accomplishments in Sci., 1971 1972 p 204-207 (For availability see N73-17934 08-34)
CSCL 03B

In an analysis of rare earth elements in various lunar samples from Apollo 11, 12, and 14 and Luna 16, it is shown that the abundances of the elements are in general smooth functions of atomic number. The one exception to the smooth function is europium, which is depleted relative to the abundances expected from the extrapolation of the other rare earth elements. This europium depletion is observed in every whole-rock sample, again with one exception, returned by lunar missions. The exception here is the common mineral feldspar. Since the mare basalts and soils are depleted in europium, there is reason to believe that feldspar with the europium occurs somewhere else on the moon, somewhere that is older than the mare basalts. As feldspar is light, it is suggested that it floated upward to the surface of the moon and is concentrated in the highlands. D.L.G.

N73-17978* National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
THE APOLLO 15 X-RAY FLUORESCENCE EXPERIMENT c29
Isidore Adler *In its* Significant Accomplishments in Sci., 1971

1972 p 208-213 (For availability see N73-17934 08-34)
CSCL 03B

The results are reported of an X-ray fluorescence experiment on Apollo 15 to obtain a partial chemical map of a large portion of the moon. Three large-area proportional counters were flown in the SIM bay of the Apollo service module. The counters had selected filters for both aluminum and silicon in order to obtain information about the X-ray intensities and the spectral distribution of the X-rays. Using these data, aluminum/silicon ratios and magnesium/silicon ratios were determined for large portions of the moon. D.L.G.

N73-17979# National Bureau of Standards, Washington, D.C. Office of International Relations.
NBS SPECIAL FOREIGN CURRENCY PROGRAM IN YUGOSLAVIA, 1971 - 1972
H. Steffen Peiser, Samual E. Chappell, Emanuel Horowitz, Harvey Yakowitz, and Doris Bluebond Jan. 1973 72 p refs
(NBS-TN-753) Avail: SOD $0.90 domestic postpaid, or $0.65 GPO Bookstore

An overview is given of grants by the National Bureau of Standards. Each grant is identified by title, principal investigator, institution in Yugoslavia, NBS monitor, and the monitor's organizational unit within NBS. The work is then described briefly under project goals and results and implications, and publications resulting from the project are listed. To demonstrate the relevance of such grants to the programs of NBS, the grant descriptions are ordered by the elements of that program structure. Author

N73-17980*# Northwestern Univ., Evanston, Ill. Dept. of Organizational Behavior and Industrial Relations.
TOP MANAGEMENT AND MANAGEMENT SCIENCE: AN EXPLORATORY STUDY IN 15 FEDERAL CIVILIAN AGENCIES
Michael J. White Feb. 1971 16 p refs Presented at the Spec. Conf. Paper Format at the Natl. Conf. of the Am. Soc. for Public Admin., Denver, 18-21 Apr. 1971
(Grant NGL-14-007-058)
(NASA-CR-130668; Publ-71-3) Avail: NTIS HC $3.00 CSCL 05A

A study of the relation between top managers in Federal agencies and the operations research and management science (OR/MS) group is reported. Sixteen managers were questioned about the following characteristics: closeness of top managers to OR/MS groups; top managers' attitudes toward the OR/MS activities; relation between closeness and these attitudes; and top managers' use of OR/MS groups. It is concluded that OR/MS is relevant to many top managers and that OR/MS has begun to play a role in decisions. Top management attitudes and actions are not related in obvious ways. The consequences to top management's use of and closeness to an OR/MS group need not be the success of the group as a professional, innovative, research-oriented unit. N.E.N.

N73-17981*# Northwestern Univ., Evanston, Ill. Dept. of Organizational Behavior and Industrial Relations.
THE IMPACT OF MANAGEMENT SCIENCE ON POLITICAL DECISION MAKING
Michael J. White Mar. 1971 42 p refs Submitted for publication
(Grant NGL-14-007-058)
(NASA-CR-130667; Publ-71-2) Avail: NTIS HC $4.25 CSCL 05A

The possible impact on public policy and organizational decision making of operations research/management science (OR/MS) is discussed. Criticisms based on the assumption that OR/MS will have influence on decision making and criticisms based on the assumption that it will have no influence are described. New directions in the analysis of analysis and in thinking about policy making are also considered. N.E.N.

N73-17982*# Northwestern Univ., Evanston, Ill.
THE POLICY FORMATION PROCESS: A CONCEPTUAL FRAMEWORK FOR ANALYSIS Ph.D. Thesis
Eliezer Fuchs Aug. 1972 456 p refs
(Grant NGL-14-007-058)
(NASA-CR-130669) Avail: NTIS HC $20.00 CSCL 05A

A conceptual framework for analysis which is intended to assist both the policy analyst and the policy researcher in their empirical investigations into policy phenomena is developed. It is meant to facilitate understanding of the policy formation process by focusing attention on the basic forces shaping the main features of policy formation as a dynamic social-political-organizational process. The primary contribution of the framework lies in its capability to suggest useful ways of looking at policy formation reality. It provides the analyst and the researcher with a group of indicators which suggest where to look and what to look for when attempting to analyze and understand the mix of forces which energize, maintain, and direct the operation of strategic level policy systems. The framework also highlights interconnections, linkage, and relational patterns between and among important variables. The framework offers an integrated set of conceptual tools which facilitate understanding of and research on the complex and dynamic set of variables which interact in any major strategic level policy formation process. Author

N73-17983*# National Aeronautics and Space Administration. Goddard Space Flight Center, Greenbelt, Md.
GENERATION AND USE OF THE GODDARD TRAJECTORY DETERMINATION SYSTEM SLP EPHEMERIS FILES
Michael G. Armstrong and Isabel B. Tomaszewski Jan. 1973 51 p refs
(NASA-TM-X-66185; X-552-73-20) Avail: NTIS HC $4.75 CSCL 05B

Information is presented to acquaint users of the Goddard Trajectory Determination System Solar/Lunar/Planetary ephemeris files with the details connected with the generation and use of these files. In particular, certain sections constitute a user's manual for the ephemeris files. Author

N73-17984# Commerce Dept., Washington, D.C.
PATENT SURVEY: SEARCH OF US GOVERNMENT-OWNED PATENTS
David J. Kieselbach 10 Jul. 1972 133 p refs
(CD Order 2-45731)
Avail: NTIS HC $8.75

The identification, development and uses of patents resulting from the aeronautical and space research supported by NASA were studied. As a pilot project, 168 patents were reviewed. Those with potential for application as manufactured products were sought. Of those surveyed, 106 are presented. The results indicate: 10 are considered as having a direct produce application, 2 are considered as having probable direct product application with some market development, and 82 are considered as having apparent product application. F.O.S.

N73-17985*# Chicago Univ., Ill.
PROCESSING AND ANALYSIS OF DATA FROM THE UNIVERSITY OF CHICAGO EXPERIMENTS ON THE IMP 4 AND 5 SPACECRAFT Final Report
J. A. Simpson and M. Garcia-Munoz [1972] 73 p refs
(Contract NAS5-9090)
(NASA-CR-130171) Avail: NTIS HC $5.75 CSCL 05B

Data from the Charged Particle Experiments of the IMP-4 and 5 spacecraft were processed and analyzed from launch through reentry. Approximately 95 percent of all data transmitted was recovered, processed, and analyzed. The computer programming and operational procedures which were developed to perform the processing and analysis of the data are discussed. The scientific results obtained from the analysis of the data are summarized. A bibliography of documents based on these experiments is included. Author

N73-17986*# Ocean Data Systems, Inc., Rockville, Md.
SPACE LAW INFORMATION SYSTEM DESIGN, PHASE 2 Final Technical Report
Jerome Morenoff, Donald L. Roth, and James W. Singleton 31 Jan. 1973 64 p
(Contract NASw-2266)
(NASA-CR-130746) Avail: NTIS HC $5.25 CSCL 05D

Design alternatives were defined for the implementation of a Space Law Information System for the Office of the General Counsel, NASA. A thresaurus of space law terms was developed and a selected document sample indexed on the basis of that thesaurus. Abstracts were also prepared for the sample document set. Author

N73-17987# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS, NO. 297
24 Jan. 1973 30 p Transl. into ENGLISH from East European reports
(JPRS-58063) Avail: NTIS HC $3.00

Articles are presented concerning the development of and progress in the various theoretical and applied scientific disciplines and technical fields, and the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences.
Author

N73-17988*# National Aeronautics and Space Administration, Washington, D.C.
NASA TECHNOLOGY AIDS
Madeleine Weckel Losee 12 Mar. 1973 7 p Presented at Women's Press Club, New York, 29 Apr. 1972
(NASA-TM-X-68945) Avail: NTIS HC $3.00

Benefits that have resulted from the application of space technology are briefly summarized. The benefits discussed include: management techniques developed by NASA, biomedical applications, safety devices, and weather observations from satellites.
F.O.S.

N73-17989# Committee on Science and Astronautics (U. S. House).
ENERGY RESEARCH AND DEVELOPMENT
Washington GPO 1972 703 p refs Hearings before Comm. on Sci. and Astronaut., 92d Congr., 2d Sess., no. 24, 9-11, 23-25, and 30 May 1970
Avail: Subcomm. on Sci., Res. and Develop.

The hearings concerning the Nation's critical energy needs are reported. The energy research and development which are discussed in terms of providing clean energy in quantities to meet the increasing demands. Topics discussed include: nuclear options, fossil fuel options, allocation of prime sources, solar radiation, energy consumption, fuel economy/efficiency, and coal gasification.
F.O.S.

N73-17990# Joint Publications Research Service, Arlington, Va.
TRANSLATIONS ON EASTERN EUROPE: SCIENTIFIC AFFAIRS NO. 296
23 Jan. 1973 33 p Transl. into ENGLISH from Eastern Europe reports
(JPRS-58053) Avail: NTIS HC $3.75

Development of and progress in the various theoretical and applied scientific disciplines and technical fields are illustrated. And the administration, structure, personnel, and research plans of leading East European scientific organizations and institutions, particularly the academies of sciences, are outlined.
Author

N73-17991*# National Aeronautics and Space Administration. Lewis Research Center, Cleveland, Ohio.
NORTHWEST PASSAGE: TRADE ROUTE FOR LARGE AIR CUSHION VEHICLES
John L. Anderson Washington Mar. 1973 38 p refs
(NASA-TM-X-2684; E-7211) Avail: NTIS HC $3.00 CSCL 01C

A conceptual vehicle and powerplant (10,000-ton) nuclear-powered air-cushion vehicle (ACV) that could open the Northwest Passage and other Arctic passages to commercial traffic is identified. The report contains a description of the conceptual vehicle, including the powerplant and operations, an assessment of technical feasibility, estimates of capital and operating costs, and identification of eligible cargo and markets. A comparison of the nuclear ACV freighter with nuclear container ships shows that for containerized or roll-on/roll-off cargo the ACV would provide greatly reduced transit time between North Atlantic and North Pacific ports at a competitive cost.
Author

N73-17992# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE 1972 ARMY SCIENCE CONFERENCE. VOLUME 2: PRINCIPAL AUTHORS H THROUGH L
23 Jun. 1972 342 p refs Conf. held at West Point, N. Y., 20-23 Jun. 1972 3 Vol.
(AD-750326) Avail: NTIS CSCL 05/2

The report, the second volume of a three volume series, contains papers presented at a research and development symposium on military sciences. The volume contains articles by principal authors alphabetized H thru L.
GRA

N73-17993# Office of the Chief of Research and Development (Army), Washington, D.C.
PROCEEDINGS OF THE 1972 ARMY SCIENCE CONFERENCE. VOLUME 3: PRINCIPAL AUTHORS M THROUGH Z
23 Jun. 1972 633 p refs Conf. held at West Point, N. Y., 20-23 Jun. 1972 3 Vol.
(AD-750360) Avail: NTIS CSCL 05/2

The report, the third volume of a three part series, concludes presentations made at a symposium relative to research and development activities in military sciences. Principal authors alphabetized M thru Z are included in this volume of the report.
Author (GRA)

N73-17994*# National Aeronautics and Space Administration. Marshall Space Flight Center, Huntsville, Ala.
SELECTED TECHNICAL SPIN-OFFS FROM THE SPACE PROGRAM
Herman L. Gilmore Dec. 1970 23 p refs Prepared in cooperation with Air War Coll., Maxwell AFB, Ala.
(NASA-TM-X-68943; AD-722090; Rept-4130) Avail: NTIS HC $3.25 CSCL 05/1

The report describes some of the problems which the National Aeronautics and Space Administration has encountered in getting people to understand how the general public has profited from the technical discoveries of the space program. Next, it describes NASA's Technology Utilization Program and comments on it. It then describes some of the many spin-offs from the space program. These include examples from management technology, communications, aeronautics, medicine, fabrics, highway safety, and weather forecasting.
Author

N73-17995# Dayton Univ. Research Inst., Ohio.
DETERMINATION OF THE CONSISTENCY OF RELEVANCE JUDGMENTS AND THE RELIABILITY OF SEARCH STRATEGIES AMONG INFORMATION SPECIALISTS FOR THE AEROSPACE MATERIALS INFORMATION CENTER Final Summary Report, 1 Dec. 1970 - 30 Nov. 1971
Frederic L. Scheffler and Jacqueline F. March Apr. 1972 102 p
(Contract F33615-71-C-1069; AF Proj. 7381)
(AD-751977; UDRI-TR-72-14; AFML-TR-72-51) Avail: NTIS CSCL 05/2

The ability of various AMIC information specialists to prepare search strategies for document retrieval was studied by providing ten typical search request statements to seven information specialists. Each specialist prepared search strategies independently. Significant variations occurred among the strategies, although even with these variations, reasonably consistent document returns resulted. The experiment indicated that the proper interpretation of a search request and the conversion of the request to an appropriate search strategy even with a well-established thesaurus is a considerably more difficult task than indexing. In another experiment, the consistency of relevance judgments among information specialists was examined. Relevance judgment is more difficult than indexing and search strategy preparation.
Author (GRA)

N73-17996# Informatics, Inc., Rockville, Md.
SELECTED MATERIAL FROM SOVIET TECHNICAL LITERATURE
Stuart G. Hibben 31 Oct. 1972 228 p refs
(Contract F44620-72-C-0053; ARPA Order 1622)
(AD-751956; AFOSR-72-2182TR) Avail: NTIS CSCL 05/2

The report includes abstracts and bibliographic lists on major contractual subjects that were completed in September, 1972. The major topics are: laser technology, effects on strong explosions, geosciences, and particle beams. A section on material science has been included as the optional fifth topic, as well as a section on items of miscellaneous interest. Only laser entries

concerning high-power effects are routinely covered in the monthly reports; in addition the present issue includes a number of selected articles on dye lasers. Author (GRA)

N73-17997# Defense Documentation Center, Alexandria, Va.
BIBLIOGRAPHY OF BIBLIOGRAPHIES IN THE DDC COLLECTION, VOLUME 1 Report Bibliography, Nov. 1967 - Nov. 1971
Nov. 1972 410 p refs 2 Vol.
(AD-752150; DDC-TAS-72-52-1-Vol-1) Avail: NTIS CSCL 05/2

The annotated citations are arranged in five COSATI Subject Categories as follows: Aeronautics, Astronomy and Astrophysics, Atmospheric Sciences, Behavioral and Social Sciences, and Biological and Medical Sciences. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, Report Number, and AD Number Indexes are included. Author (GRA)

N73-17998# Defense Documentation Center, Alexandria, Va.
BIBLIOGRAPHY OF BIBLIOGRAPHIES IN THE DDC COLLECTION, VOLUME 2 Report Bibliography, Nov. 1967 - Nov. 1971
Nov. 1972 417 p refs 2 Vol.
(AD-752160; DDC-TAS-72-52-2-Vol-2) Avail: NTIS CSCL 05/2

The annotated citations are arranged in the following COSATI Subject Categories: Chemistry; Earth Sciences and Oceanography; Electronics and Electrical Engineering; Energy Conversion (Non-propulsive); Materials; Mathematical Sciences; Mechanical, Industrial, Civil, and Marine Engineering; Methods and Equipment; Military Sciences, Navigation, Communications, Detection and Countermeasures; Nuclear Science and Technology; Ordnance; Physics; Propulsion and Fuels; and Space Technology. Corporate Author-Monitoring Agency, Subject, Title, Personal Author, Contract, Report Number and AD Number Indexes are included. Author (GRA)

N73-17070* National Aeronautics and Space Administration, Washington, D.C.
FACILITIES ENGINEERING IN NASA
Michael A. Pagluiso *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1970 p 80-82 (For availability see N73-17064 08-04)
CSCL 13H

N73-17095* National Aeronautics and Space Administration, Washington, D.C.
HAZARD PAY: AN EFFECTIVE ANTAGONIST
R. E. Alexander *In its* Proc. of the Ann. Conf. of NASA Clinic Directors, Environ. Health Offic. and Med. Program Advisors 1971 p 241-248 (For availability see N73-17078 08-04)
CSCL 05C

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EUROPEAN

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Solar Wind (NASA SP–308)

Edited by C. P. SONETT, P. J. COLEMAN, JR., AND J. M. WILCOX

The proceedings of a conference sponsored by Ames Research Center and held at the Asilomar Conference Grounds, Pacific Grove, California, March 21–26, 1971. Chapter 1 reports the discussions centered on the Sun. Chapter 2 connects the magnetic structure of the solar atmosphere with interplanetary space, while Chapter 3 is devoted to the solar wind plasma. Both theoretical and experimental topics are included. Chapter 4 reports a round table discussion on solar and stellar angular momentum and its relation to the solar wind. Later chapters are devoted to the detailed structure of the solar wind using both spacecraft and ground observational techniques, and the last chapter is an examination of the outer boundary of the solar wind and its confluence with the local arm of the galaxy. *Paperbound.* 736 pp. For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, for $6.00.

The Planets Uranus, Neptune, and Pluto (1971) (NASA SP–8103)

A NASA space vehicle design criteria publication in the series on environment. This monograph evaluates and describes the environments of the three planets on the basis of published information through September 1971. *Paperbound.* 104 pp. For sale by the National Technical Information Service, Springfield, Va. 22151, for $3.00.

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